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One Customer Pays *for Service to Ten*

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Guaranteed production estimates have become an established mode of attack in the sale of metal-working equipment. This practice is analyzed by a dealer who, by his position midway between the manufacturer and user, is well able to observe its merits and demerits

SOME high-powered, progressive machinery salesman must have originated the idea of guaranteed production estimates many years ago; or maybe, some canny buyer called the bluff of that salesman. No matter how it came about, the fact remains that practically every machine-tool manufacturer now must be in a position to offer production guarantees for his machines or step out of the picture. At the present time, manufacturers are applying a little more pressure on the idea of replacing obsolete machines, while customers, on the other hand, are demanding to be "shown." Where to call a halt on the guaranteeing of machine production estimates is a real live problem. Both buying and selling organizations are equally interested. This article is written for the purpose of pointing out some of the problems involved, not as a final solution.

While exact figures are not available, experience indicates that the average number of accepted proposals of guaranteed productions is about one out of ten. This varies, depending upon the type of machine and upon general business conditions. Assuming the average to be correct, it can be seen that one accepted guarantee must include the cost of the other nine. In other words, one customer pays for the free engineering service given the other nine. Two or more manufacturers may have submitted elaborate estimates on these same jobs, so there again is an expense someone eventually must pay. Before an estimate is finally accepted, because of changes in specifications, it may be necessary for all of those who quoted to revise their propositions many times. Even after estimates have been accepted and actual orders placed, new requirements or changed specifications may cause further expensive revisions. If the supplier is not notified because of an oversight or misunderstanding, embarrassing situations may arise with neither the customer nor the manufacturer at fault. This is simply the back firing of the high-pressure system started years ago.

It is too bad, but nevertheless a fact, that some customers request guaranteed production estimates even though they know they will not buy. They simply adopt the ideas and apply them to their old equipment. The policy of the machine tool builder is such that he is always interested in the success of his own product, no matter how old the equipment may be. He is always quite willing to be consulted and rarely is that fatherly interest abused. If a customer wants to build his own special equipment and also feels that he would like expert advice, it does seem reasonable to suppose that he would be glad to pay for it as he would his doctor.

Many purchasers never ask for such service. Their own engineers and shop officials are quite willing to

assume the responsibility of figuring the production as well as the cost of the special equipment. This policy has its advantages since they can develop their own manufacturing ideas, build the equipment themselves, and if they desire, keep it a secret. Manufacturers of machine tools, however, are willing to give these companies expert advice, and of course, always guarantee the perfect functioning of their own equipment over a fixed period of time. The objection to this procedure is that manufacturers are continually developing, often with the help of their customers, which eventually benefits all. Manufacturers or their agents may, on the other hand, in their earnest attempt to please or convince, offer guaranteed production estimates which the customer does not seek but may accept rather than cause any embarrassment.

Human Failure and Working Conditions

Guaranteed production estimates include the selling price as well as the time per piece, production per hour or production per day, with an allowance generally for human fatigue and other contingencies. In order to arrive at these estimates, the manufacturers' engineers must assume certain working conditions which may or may not be those that must be met in in the customer's plant. If they are experienced in making such proposals, they will qualify their guarantees by specifically stating these assumed conditions.

The purchasers, before making their selections, must qualify these estimates in order to fit them in with the conditions existing in their own plants. Since it is practically impossible for the manufacturer to have complete information, the purchasers' engineers and shop officials are really the only people who understand the working conditions. The closer cooperation there is between the customer and the supplier, the more accurate will be the final results.

If the manufacturers are allowed to qualify their guarantee to the effect that the production guaranteed will be met in their own plant, under the supervision and inspection of the customer, the gambling odds would be reduced considerably. This is not always possible because of many conditions, the major two of which are: the mad rush to deliver the order by the manufacturer, and the anxiety of the customer to get into production once a decision is made.

In order to interpret intelligently the guaranteed estimates, the purchaser must consider the skill of the operator, which in turn will determine the hourly labor rate, the rate of depreciation, obsolescence, flexibility, and such overhead items as special supervision, maintenance, toolroom service, use of cranes, conveying systems, trucks, floor space, and power consumption. The initial investment, and in some cases the resale value, are also quite important factors. It is not an easy task to determine accurately whether a combination of operations, performed quickly on a complicated expensive machine, operated by unskilled mechanics, is cheaper within a fixed period of time (months or years rather than days), than simple operations requiring several standard flexible machines, operated by skillful operators, consuming more total time but requiring a smaller initial investment.

Guaranteed production estimates, submitted by two or more manufacturers, may vary in both their production time and the initial cost, even though the machines are quite similar. The customer then has difficulties deciding which is reliable. All the propositions may have real merit. One manufacturing plant, regardless of its size or past reputation, may have more capable engineers than its competitors, and therefore may develop some unique method of performing the operations in question, which would be just as effective on any of the other machines offered. On the other hand, one or all may be mistaken, caused by lack of understanding of all the working conditions.

It is also not at all impossible for a company to guarantee a high production, secure the order, and then rely on some real or imaginary change of conditions which will relieve them of its responsibility. That is a fraud, and is not practiced by reliable companies. If there is a wide difference in the initial cost, it may be justified after the methods and designs are understood. On the other hand, it is considered good business to take a loss on the initial installation with the thought in mind that increased production requirements will mean additional equipment. Because of the customer's desire for uniformity, duplicate equipment will be purchased.

There are also some manufacturers of machine tools who are conservative not only in their basic designs but their guaranteed estimates. Their product may have unusual merit, and be capable of producing at even a higher rate than that estimated by anyone else. Because of their desire to play safe and be conservative, either their low rate of guaranteed production or the large size and capacity of equipment offered will present a question in the customer's mind that cannot be solved easily. Here again the customer must decide for himself the dependability of both the manufacturer and the sales engineer.

Always a Gamble

Tooling a job completely, at a fixed price, is always a gamble. Fixture and jig jobbing companies generally protect themselves by quoting a high price whenever they are requested to give a lump sum figure even though they are specialists in that kind of work. Experience has proved that the final cost of special equipment is cheaper in price and higher in quality, when dealing with reliable companies, if those companies are allowed to build the equipment and charge on a time and material basis. Machine tool manufacturers, in general, are in no better position to give a lump-sum price accurately on special equipment than these specialists. They also, in order to be fair to all concerned, should be allowed to quote on a time and material basis for special or unusual equipment. As it is now, if they get an order and find they have estimated too low, they must either absorb the loss themselves or make it up in some other way. If the price is too high, it is just too bad for the customer. Someone always pays. It is a question of who is willing to take the gamble.

Even though the engineering information as presented with guaranteed production estimates is in most cases quite limited, its total does develop into an expensive service. While, of course, the prospective customer has a perfect right to know what to expect in production and total cost, in justice to the manufacturers whose equipment he is considering, he should familiarize himself in a preliminary way with the mechanical construction, operation and general adaptability of the equipment, before requesting a production guarantee. When he does request such service, it would seem that he should be willing to pay for it regardless of whether he buys or

not. Someone must pay for it eventually. Paying for this service would also relieve the customer of considerable embarrassment. He is likely to accumulate unintentionally large piles of guaranteed production estimates from certain sources. Often this creates a feeling of obligation which cannot help but influence his decision.

The manufacturer who secures an order as a result of a guaranteed production estimate must not only build the equipment, but must also demonstrate it and meet the guarantee. Unless stated to the contrary, it is generally understood that the manufacturer will prove his estimates in the customer's plant. As suggested above, the equipment should be demonstrated in the supplier's plant before it is shipped. Demonstrating in the customer's plant first, may lead to unpleasant complications for which no one seems directly responsible and may develop into quite some expense for both. The manufacturer has a right to expect the customer to supply all of the pieces necessary so that he can make an immediate demonstration. The customer has a right to expect a near perfect machine with all the equipment thoroughly tested before it has left the manufacturer's plant.

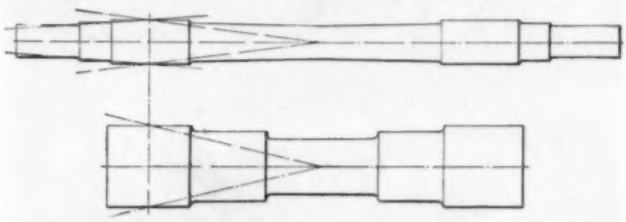
The human element plays an important part in any demonstration. The manufacturer's expert will produce one result, the customer's operator another, especially where that operator is expected to run the machine day in and day out. It is well to have a definite understanding on this point in the original proposal. Mechanical-minded men understand and appreciate mechanical difficulties, so that the average guaranteed production demonstration develops into a case of give and take, providing good faith is shown on both sides.

Keen competition is good for any business and no policy should be adopted that might stifle it. It is also against the principle of good business to play favorites intentionally or otherwise. It would seem that special sales services should be charged to those who demand it. But this idealistic theory is hard to apply in practice.

Cracks in Driving Axles—*Discussion*

F. RATTEK

THE EXCELLENT article by F. M. A'Hearn under the title given above (*AM*—Vol. 76, page 267) calls to mind a series of tests and investigations made by the Master Car Builders Association some years ago. Wrecks of freight cars were of such distressing frequency, because of axle breakage, that leading master mechanics and shop superintendents collaborated in extended investigations as to the causes. The investigations disclosed that fractures of axles centered around the wheel seats, the dust-guard seats, and the fillets between the journals and the dust-guard seats. Extended observations brought out that many of the causes of fractures were of a peculiar and bewildering nature.



Many of the fractures originated at the dust-guard seats, because of the use of poorly fitted and crude dust guards, and were responsible for scores of costly wrecks. On the dusty roads of the west, wooden dust guards caused many accidents. Even a piece of hay wire becoming wrapped around the neck of an axle caused a "ditch." Cracks, many of them developed at journal fillets, caused by rough tooling and filing, resulted in fracture.

The recommendations adopted by the M.C.B.A. were: Maintaining wheel seats on the larger diameters of axles, careful inspection of dust guards, smooth finishing of journals, journal fillets of a standard radius, smooth finishing of the dust-guard seats and radii, and all filing to be strictly prohibited.

Cracks in driving axles tend to point to probable fractures, originating in a similar manner to those in the old-style axles of ancient rolling stock prior to the adoption of the M.C.B. standard car axles. The builders of modern locomotives should go to the car builders for points on axle construction.

In Mr. A'Hearn's article he shows the advisability of having the wheel seats of driving axles on the larger diameter. That exactly conforms to the findings of the M.C.B.A. regarding the details of standard axles. The accompanying sketch shows the similarity of details of axles for cars and locomotives, the wheel seats being on the larger diameter, the journals on a lesser diameter, the diameter of the middle or vibratory section being the smallest. Sharp corners and small fillets should be avoided, as they are suspected zones of incipient cracks that will lead to fracture. Filing should be strictly forbidden. The keyway is another danger zone; all keyways should have fillets of at least $\frac{1}{8}$-in. radius at the bottoms.

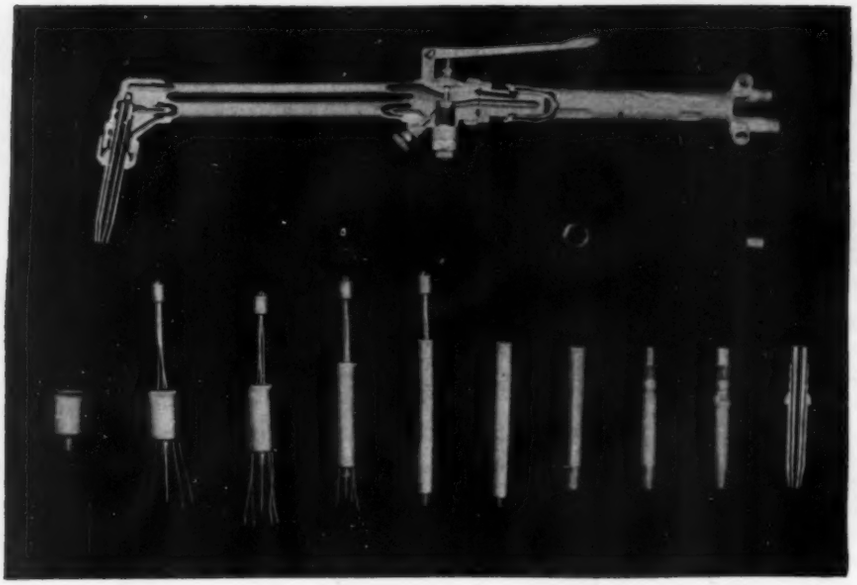
The rule of the M.C.B.A. should go further than requiring the date of application to be stamped on driving axles; all axles having reduced wheel seats, sharp corners, and keyways extending beyond the wheel seats should be condemned.

Holding Polished Pipe in the Vise

D. W. PATTON

A VERY good way to hold polished pipe or rods in the vise without marring the surface is to first wrap them with strips of paper on which plaster of paris has been sprinkled, having plenty of the plaster between the paper and the polished surface. The part covered with paper is placed between two blocks of wood having half round cuts in them, and the whole assembly is clamped in the vise. On removing the paper, if the plaster adheres to the polished surface, do not scrape it off, but wash the pipe in water. This will loosen the plaster and leave the polished surface in good condition.

Another method is to place the pipe between pieces of lead sprinkled with plaster of paris and hold it in a pipe vise.



Step by step, the swaged oxy-acetylene cutting tip is evolved

Fine Holes Swaged with Sizing Wire

Getting clean holes true to size in copper and eliminating the annoyance and expense of drill breakage are the merits of this method of making gas cutting tips

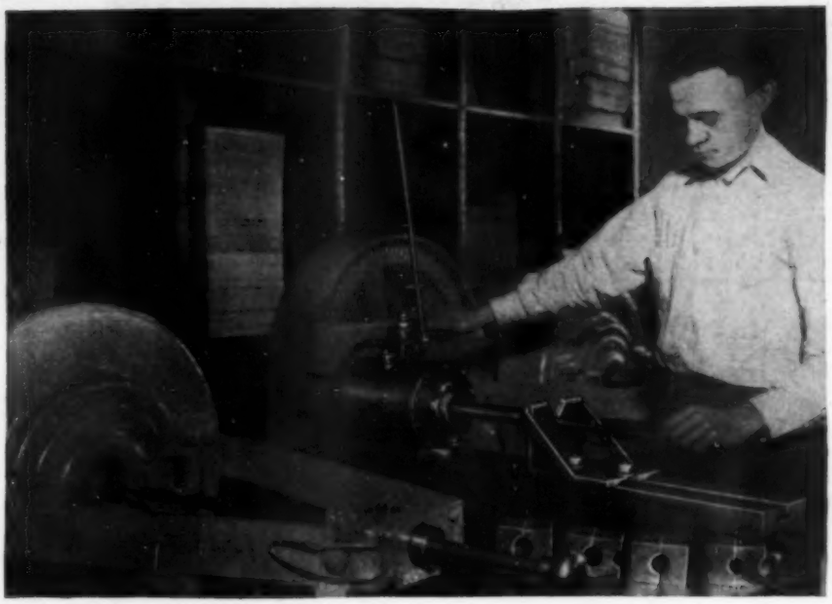
COPPER doesn't follow the usual laws of nature when it comes to drilling, particularly when the requirements are for long holes of relatively fine bore. A truly circular section is then more like the physicist's idea of a perfect vacuum—excellent to assume as a theory, but never attained in practice. Then, too, copper shavings have the habit of getting tangled up with the drill with resultant drill breakage.

All these troubles evaporate when the holes are swaged to size around piano wires. This is the method used by the Smith Welding Equipment Corporation, of Minneapolis, to make oxy-acetylene welding and cutting tips. A broad process patent covers this class of applications.

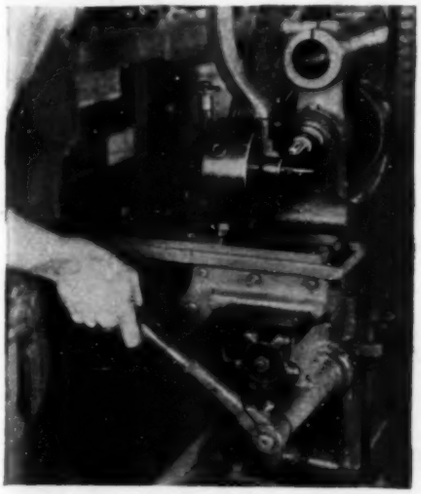
Smith gas-cutting tips are made by turning a copper slug from bar stock, drilling rough holes for corresponding gas passages, and swaging the body to length and diameter, using wire in the holes for sizing. Clean smooth holes result, true to size; but what is more important, it is possible to have the acetylene passages converge inward, parallel with the conical end of the tip.

Cutting the slug from bar stock and turning a coarse thread in the end of the temporary holding shank is the first operation, performed in a screw machine. The chief use of this shank is for attaching the slug to the swaging holder and also for holding the slugs in a drill jig while rough holes are drilled for insertion of the swage wires. In order to save time, 20 slugs are drilled simultaneously, one hole at a time. By tilting the fixture table at an angle and indexing 90 deg. between holes by a rack and pinion, the final arrangement of holes develops a truncated cone. An unusual feature of this drill jig is that the parts are held rigidly by their screw shanks instead of being chucked. To facilitate this work the operator uses a portable electric drill carrying a home-

Rough holes for the swage wires are drilled in 20 slugs simultaneously. Tilting the table 10 deg. causes the four passages to converge



On the bench are four sets of dies which reduce the slug to its final diameter. The operator uses an air cylinder to withdraw the swage wires after the slug is expanded



With the aid of a hand-indexed chuck, the operator mills two opposite flats on the body for a wrench grip

made chuck of rose shape that grips the rounded edges of the slug. He later uses this same portable drill unit to fasten the piece in the swaging holder.

No. 32 carbon steel drills suffice for this work. Previously, the center hole of somewhat larger diameter is drilled by means of a stationary bit on the tailstock of a lathe in which the slug is chucked on its outside diameter. A usual run consists of 5,000 to 10,000 blanks.

The swaging wires come in a bundle made by looping two lengths of the smaller diameter wire about the bent end of the larger, center-hole wire and swaging the group together in a steel ferrule ring. Highly polished piano wire is used, its size depending upon the size of the tip. No. 72 gage is the smallest and comes in 3-ft. lengths. The operations prior to use consist of shearing to size, bending in two and conically grinding the ends to remove burrs. Useful life of these wires is from 7 to 9 slugs.

Once the slug is screwed on the end of the tubular swage holder, it is merely a matter of inserting the wires and confining the loose ends in a tube that slips over a part of the holder. Reduction of the diameter of the slug and corresponding increase in its length takes place in four steps. An economical lot size is 1,000 pieces before a die change is warranted, although this is but the work of a few minutes. Later an additional swaging operation tapers the end. Before this is done, however, wire of smaller diameter and shorter length, 1½ in., is inserted. The net result of this last operation is to form converging passages arranged in a conical form that are smaller in diameter than the parallel passages in the main body of the tip.

In order to pull the swage wires from the body, it is necessary to apply heat by means of a blowpipe. Difference in expansion between copper and steel breaks the grip between them and allows the wire to be withdrawn with the aid of an air cylinder, as indicated in the illustration.

Up to this point the coarse threaded end of the shank is a temporary one. In fact it sometimes "crystallizes" and breaks off during the swaging operation. The next step, therefore, is to remove this screw shank and face the other end in a cut-off lathe before the finished thread and shoulder on the tip is cut in a screw machine. A turned copper collar seats against this shoulder and has a press fit on its inner diameter. This assembly is a hand press operation.

Finish turning of the rest of the body is a lathe operation, and at this time, the collar is also finished in place. Trimming the taper nose calls for the lathe taper attachment. It then remains to mill the two flats on the body for a wrench fit. This is done in the hand miller pictured. Pushing on a nickel sleeve to prevent mushrooming of the end when assembling in the torch body is the final touch.

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Aluminum Core Driers

ONE Eastern pattern shop is replacing its cast-iron core driers (forms for supporting cores while baking them) with cast aluminum. These are lighter to handle and are much less likely to warp when subjected to the heat of baking. When using driers of this type, oven temperatures should be controlled so that it does not exceed 500 deg. F.

The FOREMAN'S ROUND TABLE

Functionalizing

"SAY, AL, that outside engineer, Watson, was in my department yesterday, and we had quite a talk. He's a pretty fair kind of a guy after all, ain't he?"

"Oh, so you are beginning to think he knows his business, eh?"

"I didn't say that. He knows fishing and that takes real brains, but as far as the shop is concerned he's a washout."

"Well, I wouldn't have thought he was lazy enough for a fisherman, but I'll give him credit for being a diplomat."

"What do you mean by that; is it a knock?"

"Not at all. I merely meant that someone must have told him you were a fish hound."

"You don't have to tell one fisherman that some other man is one too; the fact just sticks out."

"I guess that's so, but how? I bet you didn't talk fish all the time though."

"No, we didn't. He talked about our production department and asked me if I had any ideas, which also shows his good sense. He thinks keeping track of material important, but says the production department as usually installed is irritating and futile. He says you can't functionalize a shop vertically, it must be horizontal—whatever that means."

"Well, functionalizing assumes using different men for different duties, doesn't it? If it is done vertically, it means giving a man a certain number of items of the same general character to look after. If done horizontally it means giving each man authority over items only as long as they are within prescribed limits of condition."

"Well, why isn't it done that way?"

"We try to do it, Ed, but we don't succeed. Take the production department. Its job consists of first getting material in and then getting it out. Now, if material is ordered on time and comes in on schedule, the production chaser only follows a routine. In other cases, an item may be late and become increasingly important as time passes. Then the chaser has to neglect other items to give the late one special attention. In the meantime, other items have become late and the chaser repeats the performance. In time he has to neglect entirely his job of preventing items getting out of line, and confine his attention to those that are already out of line. Now, if we could find some positive way of having items pass to the assistant production head when they reached a certain stage of importance, and have them pass from the assistant to the chief automatically at the critical stage, we would have an ideal functionalization. The burdens would be apportioned to the ability of the bearer, and trouble prevented instead of cured."

"Why not pay more wages and get a man that can follow it all the way through?"

"Then he's an expensive man, and must have an assistant to follow the routine things. Then you're back right where you started. You must have different men for each condition, and what Watson is trying to do is to find some way of outlining each condition, and have the proper man in charge of it at the proper time. That's what is meant by functionalizing horizontally. Not by the number of items, but by the condition of the items."

"That's just what we do now, ain't it?"

"No, it isn't, Ed, nobody has been able to mark the line between the three conditions or find a method of transferring responsibility at the proper time. As a result, the whole business of production control is haphazard. We have to give longer promises and carry a bigger inventory than we would, if we could properly divide the responsibility."

"Haven't I always said there was something wrong with the production department?"

How can purely routine items, that become vital with the passage of time, be handled? How can we functionalize in terms of urgency instead of in terms of items?

Discussions

Tools a la Carte

Any manufacturer whose type of shop work is held to limits as close as the machine work for tool practice, is certainly very foolish to pay tool makers to do this work when his factory operators are capable of handling it.

Any shop that can practice such a plan not only saves in overhead and direct tool cost, but will certainly gain in prestige throughout the trade. A shop whose work is equal to tool quality is the shop that the customer will be proud to purchase from. The economies of such a plan should be self-evident, as it puts work through the regular routine channels where it can be efficiently followed, stops the practice of paying higher wages to men in the tool room who are not tool makers, but ordinary good machinists, and reduces overhead. I understand the few shops already practicing this plan are having quite a measure of success with it. It is an efficient addition to modern management and cost reduction.

—Charles R. Whitehouse,
Standards Engineer,
Holtzer-Cabot Electric Company.

Poetry of Motion

All this time- and motion-study controversy arose because someone, or several including one Taylor, discovered that workmen knew more about doing work than they themselves did. In spite of all the work that has been done in this direction, this still remains the case.

When I was younger, say some forty-odd years ago, I used to follow my nose around a quarter-mile track without ever catching up. Others did the same, and some caught up with and passed others. One day a long-legged awkward chap came down from Maine and ran in the two-mile-race. He was all angles, violated every law of good running, but when the thing was over, he came in alone and the next man was around on the other side of the track. If that chap had had a motion study applied to him he would have been just as slow as any of the others.

What we should do is to teach our workmen to know just what it is that they are to do and leave it to each one to find the motions which are best for a man of his height, weight and disposition. If he is adequately paid for what he accomplishes and feels a reasonable security against wage cuts, he will find that best way. While it may look just as awkward to us as this runner from Maine, if it gets the results, we will all be perfectly satisfied. —E. H. Fish.

How Much Economics?

Foremen and workmen who have occasion to give out information should study economics; it should be an essential course for them. In checking up almost any organization, you will find a large percentage who do not know how a business is organized or operated, not even the one they are working for.

A foreman, who had worked in a foundry that made castings for a washing machine company, had occasion to buy a casting from this latter place after leaving the foundry. The foreman had to pay 85 cents for the casting, and knowing that the molder was only paid 0.75 cents a piece, he became rather hostile and thought that it was robbery on the firm's part. He felt that the molder should have been paid somewhere near the price he himself paid for the casting. This foreman did not understand what other work was necessary before this piece was ready to sell to the customer. In this particular case it took a lot of explaining before he saw that the price paid the molder and the price he paid for the article had some definite relation that was justifiable.

—J. Morgan Johnson,
Apprentice Supervisor,
Tri-City Manufacturers Association.

Old Man Opportunity

Everyone knows the difficulty of breaking a man in to a new job and the worry it is to the foreman. This could be largely avoided without financial cost if men received instruction in their spare time. As ambitious men will expend both time and money attending evening classes, I don't think they would fail to take advantage of shop instruction.

It is a matter which should be left to the judgment of the foreman, the idea itself is excellent but it would need adapting to meet individual circumstances. The average machine hand would not be able to take advantage of tool making instruction, sufficient to become a reliable tool maker himself.

—W. E. Warner, *Herts, England.*

While some men do prefer to lie abed till noon on their days off, an amazingly large number of workers in our manufacturing industries desire to take advantage of every opportunity to increase their store of knowledge.

This ambition should receive consideration, yet it would not be the proper thing to allow these men to learn on their time off. Such procedure would tend to slow down the output; and there would be tendency to loiter and talk to other workers.

In nearly all industrial centers are schools, many of them free, in which instruction is given in the mechanical arts. Work and play, instruction and efficiency must be made distinct.

—Geo. Belbes.

How Much Economics?

If we could only recognize economics when we saw it, there would be no question but that all could learn something about it. We read *The Road to Plenty* by Foster and Catchings, thinking that it is a sensible solution of the problem of unemployment, and we wonder why all do not join in advancing the program. But then some economist comes along and says that the theories in the book were proved false long ago, and that to adopt them would only make the depression worse.

We read President Hoover's plans for breaking the depression, and they seem to be a sensible constructive program. Then we meet someone who claims to know more economics than President Hoover, and he tries to point out why we should not do as the President advises.

We read that people should spend more freely, and that they should save more. We read that reducing wages will provide more work for others. We read that raising wages

will increase purchasing power and in that way increase employment. And we have reason to think that most of the arguments are nothing but propaganda, spread by people who neither know or care about the actual economic facts.

Possibly the best advice is either to learn economics thoroughly or leave it alone entirely. Either study the subject well enough to be able to point out the errors in a book like *The Road to Plenty*, or leave the subject alone. A little knowledge is particularly dangerous on a subject in which most of the printed matter consists of disguised propaganda, and much of the propaganda comes from sources which should be above anything except an honest effort to secure the truth. —A. W. FORBES, *Forbes & Myers*

Till It Hurts

The suggestion to adopt a compulsory method of obtaining funds should be strenuously resisted by all if we are to continue to regard ourselves as free to decide our problems in our own way.

Unemployment is wrong, compulsion is wrong, and two wrongs never did make a right. The remedy for unemployment can not be applied in the factory; it must start in the schools among the rising generation. Older persons are too deeply impregnated with present-day shortcomings to change easily. Hence the difficulty of seeing the other fellow's viewpoint.

—P. BENTLEY, *Foreman, C.P.R. Shops, Calgary, Canada.*

Traffic Congestion

There are two distinct types of stoppage to be dealt with in the average works—man-hours, or machine-hours lost, caused generally by mechanical failure, shortage of workers or of work, and the progress of a job suspended while other work is being done, no apparent loss occurring to output.

It is output which justifies the employment of men and machines. Hence when men or machines are not doing useful work, a foreman should report the matter to his superintendent so that men, machines and work may be brought together to produce the highest efficiency.

—D. O. DUNSTONE, *Durham, England.*

Traffic Congestion

Failure of tools is the only valid reason for stoppage of operations. In measuring management, the facts stated would show ignorance of shop equipment, inadequate routing, hindsight planning, and incompetent production control. Job costs would be a continuous headache for all parties who saw the figures. Estimating would be black magic, and anything except the yearly balance sheet would be merely another story book.

Stoppage of an operation should be the rare exception, rather than the rule. When once a job is routed and delivered to the shop, it should not be stopped or changed from one machine to another unless the production manager and the superintendent or foreman agree to the absolute necessity of the change—the foreman, because his costs go up; the production department head, because the change reflects on his department. The consequences, resulting in the shop from the change should be shown to the works manager, as he is responsible.

The sending in of reports will not in itself help. It will call attention to and show reasons for unnecessarily high costs and also put the responsibility where it belongs. The reports would be management's cue to start somthing where it would do the most good. —E. E. GAGNON, *Mechanical Superintendent, Raybestos-Manhattan Company.*

Muzzling the Press

Employers usually ignore what workpeople say. They are fully aware that workers, disliking much that is imposed upon them, voice their grievances among themselves. Notwithstanding this, even prominent socialists and union leaders are given employment, and often retained, when others of less pronounced views are dismissed. The outlook of workpeople and employers being so opposite, differences of opinion are to be expected. But where opposed views are brought before management straighforwardly and politely, no harm will be done, and things may be adjusted. It is tacitly understood between employer and employed, that both must arrange the best conditions for themselves. Most employers prefer straightforwardness to sycophancy, and tolerate a statement, though unpalatable. A man who expresses his opinions candidly should be, and I believe is, respected in the long run.

It is one thing to differ in opinion and quite another to be rude, disloyal, and mischief-making. The limit is reached when this spirit is displayed, and steps must be taken to check it.

—WM. BRYCE, *Sheffield, England.*

The Outsider

Present conditions afford an ideal time for the manufacturer to improve his shop so as to be ready for a revival of business. This applies to the manufacturer who has an established line with practically no changes, as well as to the jobbing shop. In the former, new methods should be studied and carried through the experimental stage, and when finances permit, the tools and machines required, should be spotted.

An outsider who has a diversified knowledge of manufacturing can, by concentrating on operation, make valuable suggestions and improvements. Management is forced to adopt scientific methods in order to stay in the game. —C. F. STAPLES.

A prolonged period of subnormal business is an opportune time for reorganizing and improving production methods and general shop conditions, because more thought and attention can be given to the problems involved. Whether this reorganization program should be entrusted to an outsider, who specializes in such activities, or to a member of the shop organization depends entirely upon the amount of reorganizing that is necessary.

If the equipment is up-to-date and the supervisors and operators are reasonably familiar with orderly production methods, worthwhile improvements in operating efficiency would result from an intensive study and the revamping of existing conditions and practices; this can usually be most conveniently and economically accomplished by somebody selected from within the organization.

On the other hand, an outsider could undoubtedly accomplish more in improving operating conditions in a shop that has been allowed to run down to the shabby stage, where the equipment and operating methods are obsolete and the personnel is incapable of working out its own solvation.

—G. A. BAESLACK, *Process Engineer. Westinghouse Electric & Mfg. Co.*

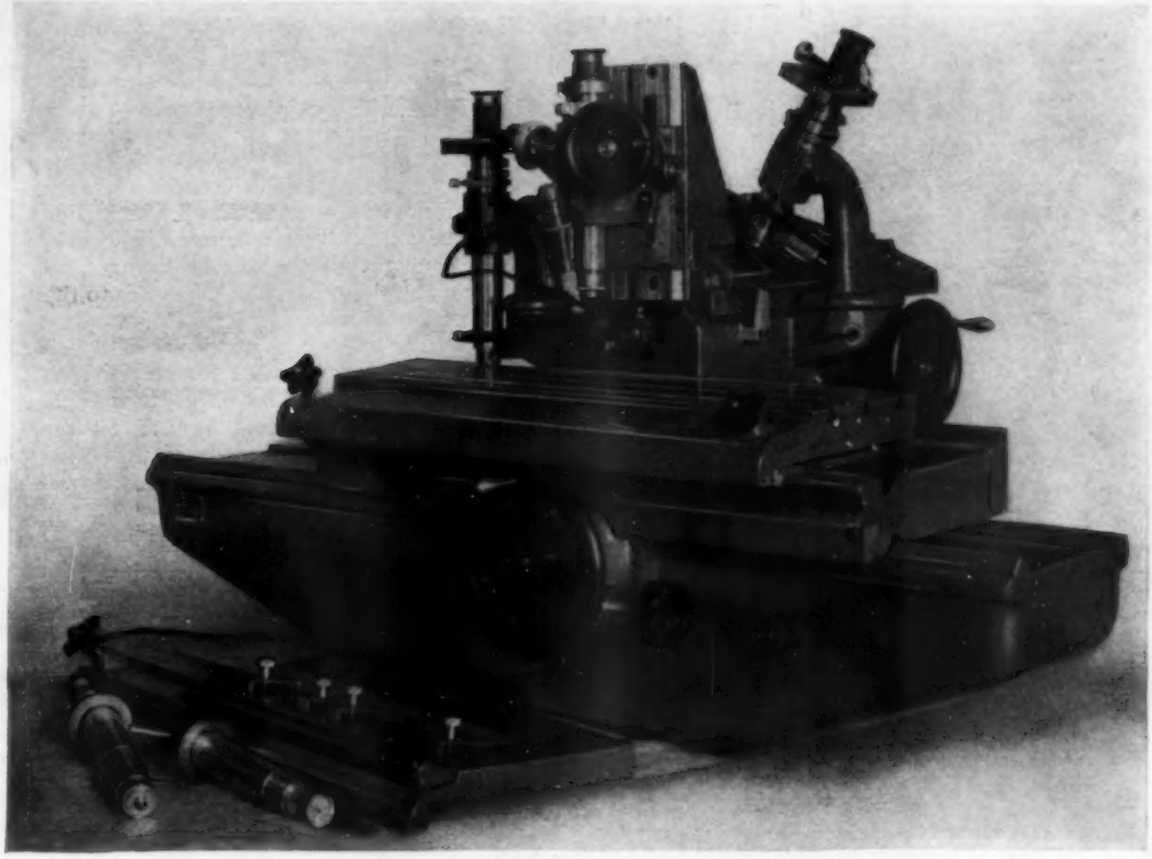


Fig. 1—This machine will measure lines anywhere on a 4 in. x 16 in. surface without unclamping the work

A New Measuring Machine

OLIVER P. VAN STEEWEN
Berlin, Germany

Most devices of this kind measure in terms of length only. This one accurately gages length, breadth and profile

THE FIRST measuring machines were intended for checking end-measuring rods and gages. They allowed of taking measurements in only one direction. To be of greatest use in the shop, a measuring machine must be able to measure not only along a single center line, but also along rectangular or polar coordinates. It must do this without unclamping the piece being measured.

The machine shown in Fig. 1 has been developed to fulfill the requirements outlined above. The accuracy of this apparatus on rectangular coordinates is in the order of 0.000039. Angular measurements are taken by means of a goniometric miscroscope, or with the help of a circular table reading to 1 min. of arc.

The work table and the carriage, which carries the locating microscope, slide on ways at right angles to one another. Each is provided with an accurate scale. Two fixed microscopes — one for the table, the other for the carriage carrying the locat-

Fig. 2 — Profiles may be measured on a table illuminated from below. The rays of light are parallel

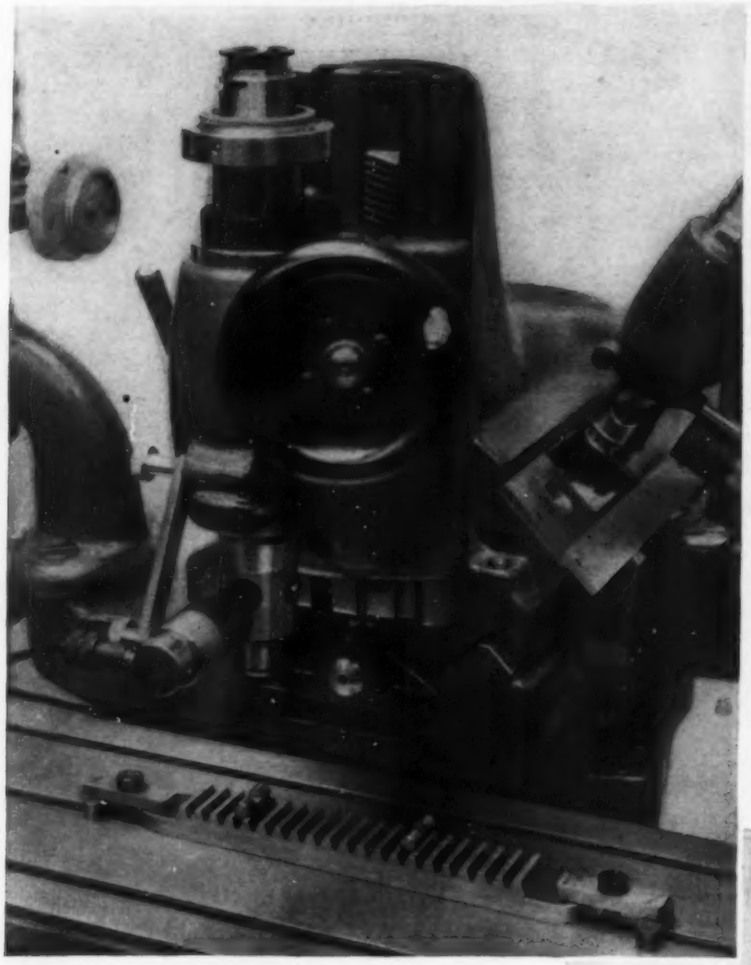


Fig. 3—To check the pitch of a precision rack, two plugs with microscopic reference lines are set between the teeth. Flats on the plugs are levelled by a straight edge set across them. Measurements are made between the two reference lines

ing microscope—make the reading of the table displacement accurate to the degree mentioned above.

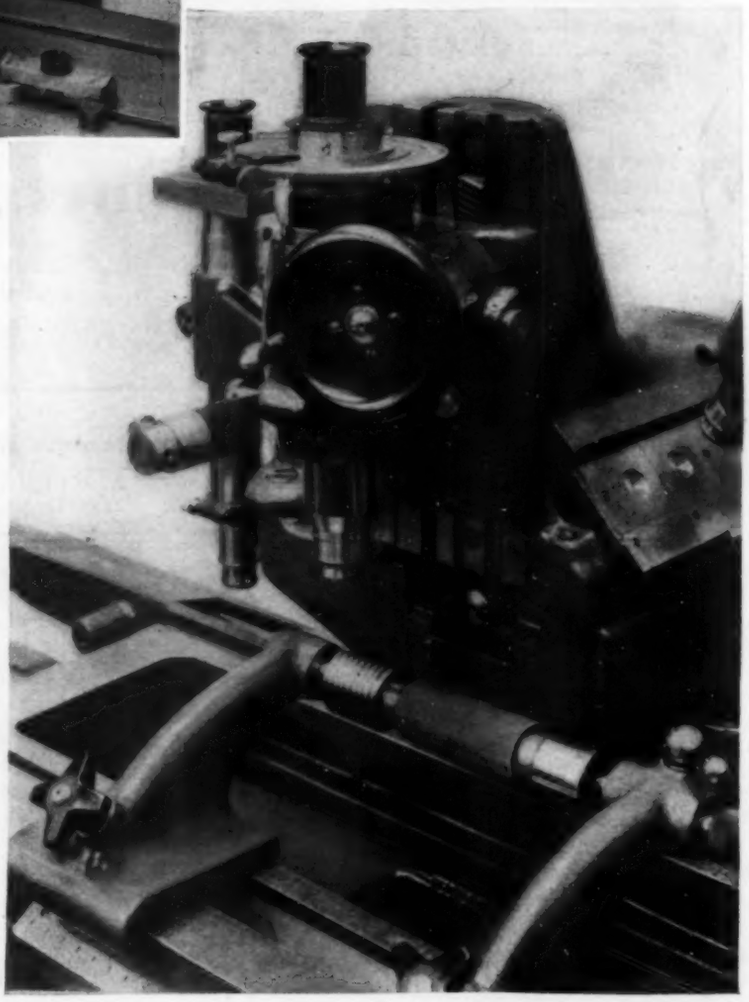
The standard scales used are of rustless steel having the same heat expansion coefficient as ordinary steel. Thus making most measurements independent of room temperature. The length of these scales corresponds to the movements of the apparatus, which is 100 mm. for the carriage and 400 mm. for the work table, or roughly, 4 in. and 16 in. respectively.

Profiles may also be measured with the apparatus, but as light from below is necessary for such work, the regular table is removed and one with a glass surface substituted. In other cases, an elevated supporting device may be used and a light placed below it. The lamp used for illuminating the object is equipped with a collimator for obtaining parallel rays of light. This obviates any deformation of the profile of the object. A monochromatic light filter eliminates all injurious reflections and also gives a sharp image of the observed object. The source of light moves with the microscope so that the latter is always in the center of the parallel rays. For measuring threads and similar work, the light source can be changed so that its rays are at right angles to the sighting plane.

The apparatus can also be equipped with a dark chamber for photographing profiles. The dark chamber is set directly on the locating microscope and is focussed in the usual manner.

■

Fig. 6—The locating microscope can be turned to any angle by the thumbscrew near its top. As the cross hair on the object lens corresponds to 0 deg., the amount the microscope is turned may be read from the horizontal dial near its top. All the elements of a thread may be measured optically in this way



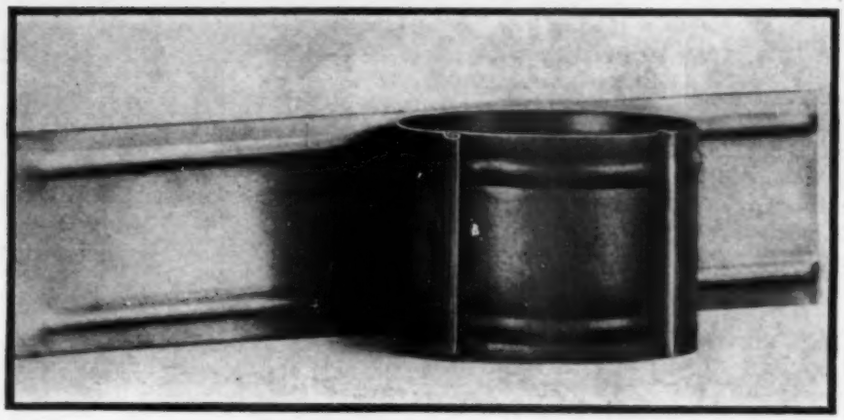


Fig. 1—Making parts like this at the rate of 125 pieces per minute marks a distinct advance in the art.

Forming and Seaming 125 Tubes a Minute

C. W. HINMAN
Chief Tool Designer, Kobzy Tool Co.

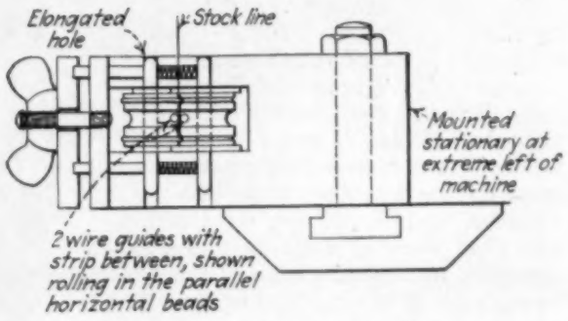

Elongated hole
Stock line
Mounted stationary at extreme left of machine
2 wire guides with strip between, shown rolling in the parallel horizontal beads

Fig. 3—Two small rolls form the beads that encircle the tube

THE PRODUCTION of new parts in the multi-slide press is always an innovation because of the recent development of the machine. The chief novelty of this set-up is that it permits production of a fairly difficult piece at a high rate. Credit for this design belongs to C. L. Ottoson, of the U. S. Tool Company, who is here collaborating in tool design for the new multi-slide machines made by his company.

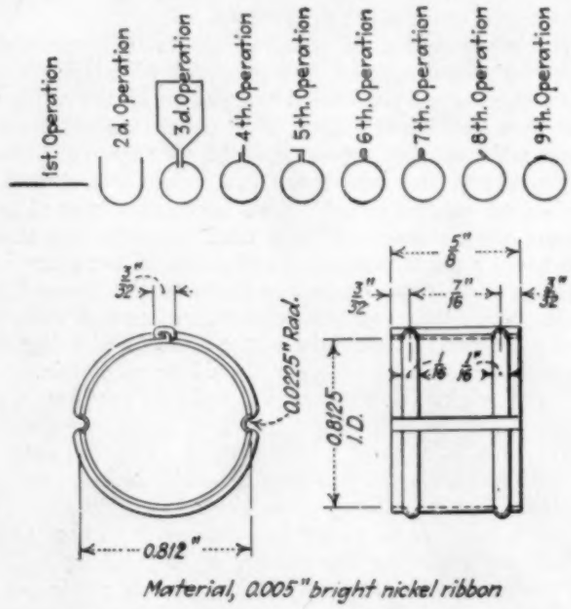


Fig. 2—Nine operations are necessary to complete this finished part

In this set-up we are able to complete and deliver a difficult piece of work at each stroke of the press, or at the rate of 125 per min. One straight cutting-off blade and the five cam-actuated forming slides regularly supplied with the machine are used. The slide movements are timed by special cams, and some extra ones have been added.

The material, pure nickel strip 0.005 in. thick and 0.625 in. wide, is unwound from a roll by the pulling action of the feeding jaws of the machine. The strip, edge up, first enters between two steel wire guides located horizontally along the center line of the strip. It next passes through a small rectangular frame in which are mounted two adjustable spool rolls, comprising mated male and female wheels that "roll in" the two parallel horizontal beads the entire length of the edges of the strip as it is fed along.

The guides are continued up to the stationary cut off head *K* through which the strip is drawn by the feeding jaws. Upon the right side of this head, the blank is cut off by the flat cutter *J*, attached to a sliding bar *Q* and actuated by a special cam on the front shaft. The feeding throw is adjusted so that the length of the blank is sufficient to form a tube 0.8125 in. diameter, plus an additional allowance for making the hooked seam that joins the free ends.

The blank to be formed into a tube, is fed tangent to the front side of the circular forming post *G* and is prevented from falling, when cut off at *J*, by the spring com-

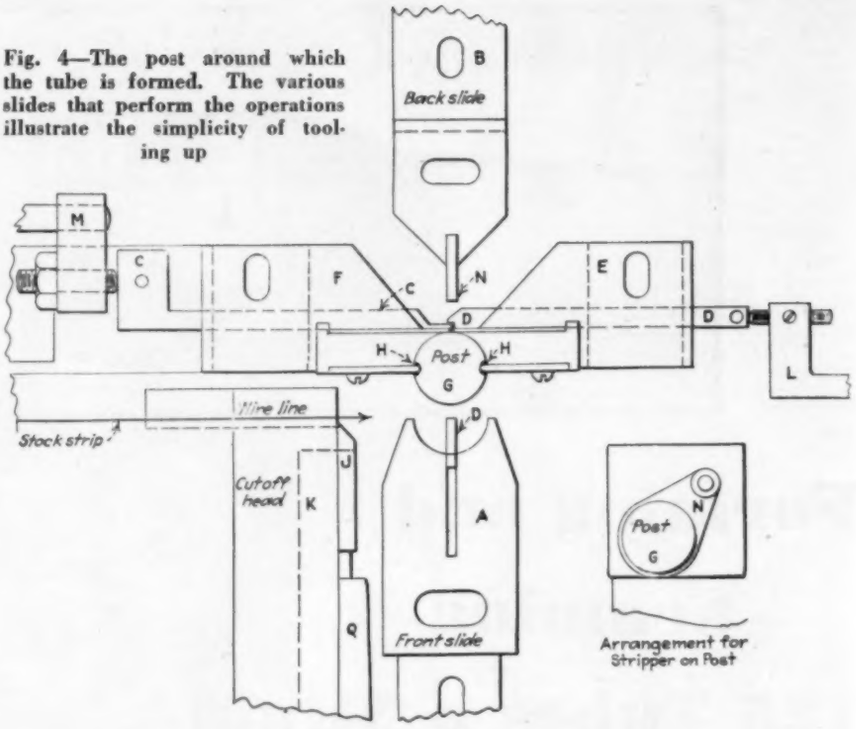
pression blade *P* in the center of the front forming slide *A*. This slide is advanced just prior to the cutting-off operation, and holds the blank against the post.

Two vertical grooves are cut in the post *G*, diametrically opposite one another. In these grooves are formed the vertical beads indented in the work by the small punches *H—H*, mounted in right and left slides *E* and *F*.

Previous to the advance of *A*, back slide *B* is advanced until its positive off-set blade N touches the rear side of the post.

The concave face in the front forming slide *A*, forms the blank *U*-shape around the post, and the simultaneous advance of the right and left forming slides *E* and *F*, complete the circle of the tube. Slides *E* and *F* are advanced by the standard right and left cams on the machine, while sliding within *E* and *F*, are the right and left seam forming tools *D* and *C*, controlled by auxiliary cams attached on the sides of the standard right and left cams. Slides *D* and *C* are advanced after *E* and *F* have completed the circular tube. The latter remain around the work on the post while *N* is gradually withdrawn, as *D* and *C* advance and begin to form the seam as shown in operations 4 and 5.

Fig. 4—The post around which the tube is formed. The various slides that perform the operations illustrate the simplicity of tooling up



When *D* and *C* recede, *N* is again advanced, bends down half the seam as shown in operation 6, and withdraws. Then *C* and *D* again advance, pinch the seam (oper. 7) and withdraw. Next *D* is advanced alone, and pushes the partially formed seam toward the left as shown in operation 8, and withdraws. Now *N* is advanced a third time and flattens the seam, completing the work as shown in operation 9. Now the slides all recede, and vertical stripper *N*, which has been held above the work, and which surrounds the post by a sliding fit, descends and pushes the work from the post.

At the lower end, and in the center of the post, a wire is attached, having a curved length leading out at the back of the machine. The pieces of finished work, when pushed off the post, slide by gravity along this wire into a suitable receptacle on the floor.

The thickness of the tool slides and width of cut-off blade are sufficient to handle other similar pieces up to 1 in. high. A screen mesh tube can also be made in the same set-up by changing the forming blocks *H—H*.

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Jig With a Floating Work Holder
Discussion

DONALD RAEBURN
Glasgow, Scotland

IN HIS CRITICISM of my method of reaming work held in the chuck of a turret lathe, as described by me in an article under the title given above (*AM*—Vol. 75, page 285), C. A. Coppack (page 790) suggests that it is not productive of either great truth or accuracy, owing to the great number of "ifs" that the method contains. In the original article by H. R. Schmidt (Vol. 74, page 693), it was pointed out that the finished bores of the wheels must be square with the sides, and that this result was not being attained, because the pierced holes ran out of true and the slender reamer followed the path of the pierced holes.

While there is no reference to the true running of the outside diameters of the wheels, we must assume that a close approximation is required, and that in designing his jig, Mr. Schmidt fulfilled the necessary requirements of the work by securing reamed holes that were square with the sides of the wheels. Therefore, we must accept the machining of the outside diameters as having been performed in another operation, and that sufficient material was allowed in the blanking process.

In my suggestion of steady brackets to support the reamer, slight errors of indexing and of alignment of turret holes were considered in relation to the work as illustrated by Mr. Schmidt. That chucks do not remain true is admitted, but a great deal depends upon the make of chuck and the care given it. While the operating mechanism controlling the jaws becomes distorted and impairs the accuracy of their truth of grip, the chuck face usually remains true. In the case of the three-jaw chuck, a three-point contact is given to the face of the work. With the proposed brackets in use and with the work supported by the face of the chuck, and using two reamers, the amount of error should be negligible.

In the original article it was stated that the holes were bell-mouthed on both sides, to which there is no objection. This is a point worth noting, as in the case of these thin wheels the bell-mouth would assist in the assembling and in adjusting the sides in alignment. Mr. Coppack inquires as to when a reamer is correctly supported, and supplies the answer by suggesting holding the reamer in the turret with the absolute minimum of projection. Before this plan could be adopted, I consider that it would be necessary to remove the chuck jaws and fit an adapter to the chuck face.

NEW BOOKS

APPLIED WING THEORY—*By Elliott G. Reid, professor of aerodynamics, Stanford University. 231 pages, 5¾x9 in. Indexed. Appendixed. 85 diagrams. Clothboard covers. Published by the McGraw-Hill Book Co., 330 West 42nd St., New York, N. Y. Price $3.00.*

Mention of wing theory immediately sends cold chills up and down the spines of airplane and aeronautic designers, for most existing English texts are of a character so advanced, so academic, or so condensed that there is little incentive to use them either in the classroom or in the airplane engineering office. Anticipating the need for a concise, yet complete and readable text, this author has collected the technical presentations of Prandtl, Lanchester, Kutta, Joukowski, Munk, Glauert, *et al.*, brought them up to date, coordinated them, and presented the information contained in them in more elementary and consequently more readable and useful form. Explanatory and corollary material is supplied from the author's own teaching experience.

The book is singularly free from the pedagogy and demagogy often so evident in texts written by college professors. If such an abstract subject as wing theory could be presented in friendly fashion, this text does it.

STATISTICS OF RAILWAYS IN THE UNITED STATES *(44th annual report, for year ended Dec. 31, 1930)—Prepared by the Bureau of Statistics of the Interstate Commerce Commission. 152 pages, 9½x11½ in. All tabular matter. Published by United States Government Printing Office and available from Superintendent of Documents, Washington, D. C. Price $0.30.*

The annual volume of statistics on the railroads, providing complete tabular information on both steam and electric railways and other common carriers, including telephone, telegraph and cable, express, and pipe line companies. Accurate information on everything from gross income to number of grade crossings. If you want to know statistically how railroads work, with all the figures, this is the book.

THE ADVANCED TECHNIQUE OF PORCELAIN ENAMELING—*By J. E. Hansen, Research Engineer, Ferro Enamel Corporation. 312 pages, 5½x8¼ in. Indexed. Clothboard covers. Published for the Ferro Enamel Corporation by The Enamelist Publishing Co., Cleveland, Ohio. Price, $3.50.*

Some years ago the Ferro Enamel Corporation published a textbook devoted to the application of wet process enamels, known as "The Technique of Vitreous Enameling," and regularly used it in its semi-annual "School for Enamelers," held in Cleveland. The present edition incorporates the features of the old edition with new chapters on more advanced lines, including considerable data on shop management as well as the technique of modern porcelain enameling.

Using the textbook system of paragraph topic heads on the outside page margins, questions at the end of each chapter, and a rather complete index, the book serves admirably either for school work, or for quick reference for the plant executive. Details of technique are taken up in Part I, while Part II takes up the management phases.

ECONOMICS OF TOOL ENGINEERING—*By Alexander P. Gwiazdowski, assistant professor of shop practice, University of Michigan, and Chester B. Lord, associate editor, "American Machinist." 203 pages, 5¾x9 in. 146 illustrations. Indexed. Clothboard covers. Published by the McGraw-Hill Book Co., Inc., 330 West 42nd St., New York, N. Y. Price $2.50.*

TOOL AND DIE DESIGN—*By Charles Bradford Cole, president, Tool Equipment Sales Co., and Frank W. Curtis, research engineer, Kearney & Trecker. 135 pages 5½x8½ in. 144 illustrations. Indexed. Clothboard covers. Published by American Technical Society, Drexel Ave., at 58th St., Chicago, Ill. Price $1.50.*

As mass production has inevitably replaced single-unit manufacture, dies, jigs and fixtures have become shop essentials. With their increasing use, certain definite basic principles have been evolved, principles that apply to every die, every jig, every fixture. Both of these books set down these principles and illustrate them by examples. Their content is fairly similar, but the methods of attack are entirely different.

Cole and Curtis present elements of die, jig and fixture design and indicate how these elements are combined to create the finished tool. Gwiazdowski and Lord discuss the development of tool engineering, various methods of metal-working, application of jigs, fixtures and dies in various industries, and general economic aspects. Thus the first sticks to principles and applications, the second gives the general review of the field and the economics concerned. Though each is somewhat limited, together they make a well rounded text.

More practical kinks of die and fixture design are presented by Cole and Curtis; more up-to-date engineering information is presented by Gwiazdowski and Lord. For the first time, Cole and Curtis make clear the differentiation between a jig and a fixture; likewise for the first time, Lord and Gwiazdowski give a complete and carefully annotated list of metal-working processes. Either presents a good picture of the field, either is a worthwhile addition to the tool engineer's shelf of books, but only together are they comprehensive.

Gwiazdowski and Lord have gone to leading metal-working companies for their information, but in presenting it have been inclined towards using illustrations from current technical magazines which are not always directly related to the text. They are terse and direct, occasionally even dogmatic, in statement and opinion, and might have done a better job of technical editing. Cole and Curtis have striven so diligently to present every essential fact that occasionally the reader is snowed under by detail. But the reader taking the middle course and comparing statements of the two texts subject by subject will get an authoritative picture of the field, as well as much worthwhile information.

A Small Shop Modernizes

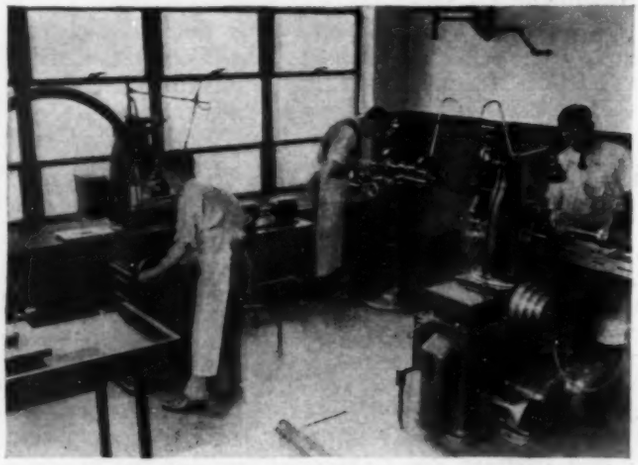
A time of low prices is the time to modernize. Here is a man who built his ideal shop in a tough year and here is the shop he built

TAKING advantage of low construction costs in 1931, the Gopher Machine & Tool Works abandoned its old quarters in a converted store in a Minneapolis tenement building and built itself the thoroughly modern shop pictured. No sudden decision is implied, as O. C. Hedin, owner-manager, had been saving for his ideal shop for years. Today, he faces the world free and clear of debt, with as well planned and modern a small shop as can be imagined. Of the machine tools, the jig borer is new, as are the four power presses. The rest of the equipment ranges in age from 4 to 11 years. By taking good care of the machinery, repainting it occasionally and protecting the ways by leather aprons, however, it still looks new to the eye of the casual observer.

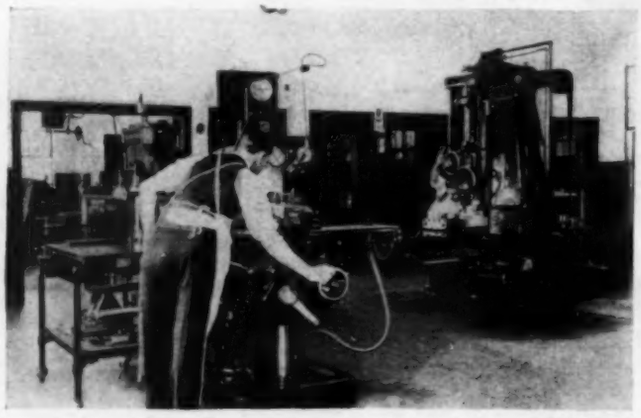
Cleanliness prevails. Each man is responsible for his own machine and is given 5 min. of pay time each day and a half hour on Saturday for cleanup.

Pay is on an hourly basis at a rate commensurate with high-grade die makers in this section of the country. Normally, 15 men are employed, including a grinder hand, a milling machine operator, who also handles the jig borer, and two shaper hands. One of the latter is being trained by the foreman as a heat-treater. Most of the work contracted for is die building, with occasional jig work and form tool manufacture, all obtained locally. Work is done on a cost-plus basis, a tribute to the integrity of the organization.

The building, which measures 50 x 150 ft., and cost $18,000, is made of steel, brick and hollow tile, with almost a solid wall of steel-frame windows on the north side. An opaque prism glass diffuses the light, as does the rough white plaster with olive green wainscoting. By using 24x8-in. channels for roof support, all interior columns are eliminated. Floor is asphalt tile, and linoleum pads at the machines protect it from being cut by chips. Running lengthwise in the floor are four conduit ducts made of 16-lb. channels covered by flush steel covers, grounded and drained at intervals. This simplifies wiring the machines, which are all motor driven. Fuses, switches and bus bars are found in a steel cabinet in the center of the main shop, next to the foreman's desk. Overhead on 14-ft. centers are eighteen 150-watt lamps in enameled reflectors, so that adequate illumination is available at all hours.



Shut off from the main shop by glass doors is the precision grinding room, containing two surface grinders and two tool grinders. Form tool grinding is done on the universal machine at the right



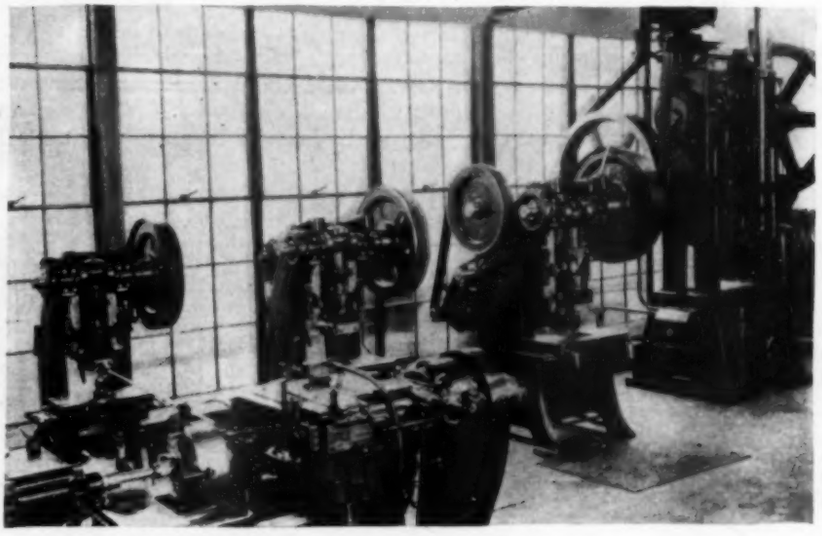
At the forward end of the shop are a knee-type miller, vertical miller and jig borer. Over the miller can be seen the electric program clock and gong that times the working interval

Comfortable working conditions are provided by unit heaters, thermostatically controlled, electrically refrigerated drinking water, and fountain bowl wash

Four shapers ranging in size from a 6-in. portable to a 32-in. stroke machine, an 11-in. toolroom lathe, 18-in. geared head lathe, and a battery of drills are seen in this view

Space between the main shop and the building next door provide rooms for cutter storage and portable tools, such as power filers, flexible shaft equipment, die grinders and electric drills

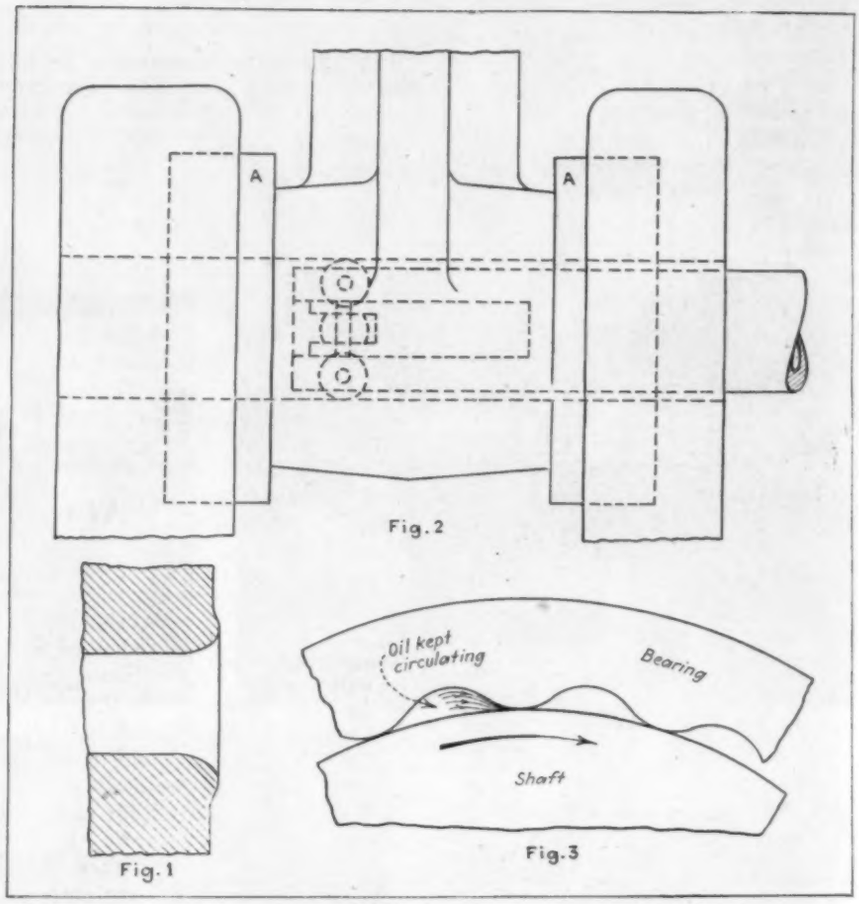
In a separate room are the heat-treating furnaces, all gas-fired. Thermocouples in each furnace allow the temperatures to be read separately on a station-type potentiometer. Under the hoods are draw salt baths and a cyanide pot. The containers in the central foreground are oil and water quench tanks



Punch presses are for tryout of dies only. If production work was obtained for them, they would never be available for check runs. The 150-ton press at the right has a built-in pneumatic cushion bed supplied by a portable air compressor in the basement

Burnishing Bearings

HARRY SHAW
Consulting Engineer,
Heywood, England



Bell-mouthing may be remedied by trimming the ends of the bearing after rolling or by using a special fixture

Hardened steel balls may be employed to produce a dense smooth finish on bearing surfaces. But the author's experience indicates that the process has several limitations

I WAS interested a short while ago to notice that a machine has been introduced to finish the bearings of such parts as connecting rods by a peening process. The process consisted of small rollers hitting, with hammer-like blows, against the surface of the bearing, compressing the material and thereby producing a smooth finish and bringing the bearing to size.

The method of bringing bearings to size by forcing steel balls through is by no means new, so that one may wonder why the process is not more used and whether this lack of use is due to some inherent weakness of the process. At one time I conducted certain experiments with the peening or rolling of bores and bearings. Particulars of these and the results obtained may be of interest and may prevent others, who may have similar ideas, from going over the same ground.

Four hardened steel balls, journalled on pins in a mandrel so held that they just projected from the mandrel, and adjustable outwardly, composed the tool with which the rolling was done. This tool was fixed to the ram of a shaping machine, the work fixed to the table, the balls adjusted to press just into the surface of the bore, and the machine started. The work was turned slightly at the end of each stroke.

In this way, the four balls would compress the material at four places down the bore at each stroke of the shaping machine. To bring the work to size, the balls had to be allowed to pass out of the bore at each end, which made the ends bell-mouthed, metal spreading out on the end surfaces as shown in Fig. 1. To remedy this, a certain amount of metal was left on at either end to be removed after rolling, for a bell-mouthed bore is likely to alow dirt to creep in.

Later, the work was held between two hardened pieces *A* (Fig. 2) that had holes of the size required. In this way the balls were prevented from bell-mouthing the work, because the hardened pieces restrained them from pressing outward as they passed the ends. The work was first correctly aligned between the two hardened pieces by means of a plug ground to fit the bearing and the end pieces.

After each quarter turn of the work the balls were adjusted outwardly, to reduce the bore further, but for about the last three turns the tools were traversed up and down without adjustment. The object of this was to give permanence of size and to true up the bore, independent of any inaccuracy in the tool itself.

It was found that this rolling process produced a highly polished, dense surface, but that this surface was in reality a series of slight hills and valleys as shown

exaggerated in Fig. 3. It was thought that this would not be conducive to long life and a low coefficient of friction, but experiments did not support this supposition. It was found that the lobes formed reservoirs for oil, and when rotation started the cuniform spaces induced a flow of oil over the entire surface of the bearing, producing a low coefficient of friction and durability.

A further method of rolling consisted of passing balls held in a mandrel through the bore while the work rotated. The effect of this was to produce a fine spiral finish on the bore. Under tests it was found that this spiral effect caused the oil to flow to one end of the bearing. To prevent this the bore was finished by passing the balls up and down the bore. The double spiral finish produced by this method maintained a good film of oil.

To test the efficiency and type of oil film produced by the double spiral finish, a bearing and spindle were assembled, run for a few minutes with a good clean lubricant, the spindle stopped, and the surplus oil at each end wiped off. A little oil mixed with rouge was then placed on the spindle at one end, and when a trace of

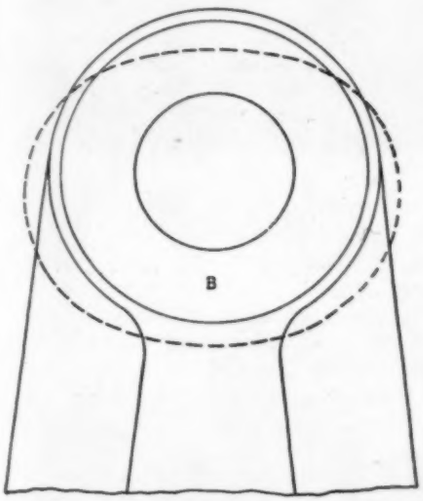


Fig. 4—Lack of uniformity in the bearing walls may result in distortion after the bearing is in service

the rouge appeared at the other end the spindle was stopped. The assembly was dismantled and the oil film examined. The rouge was spread thinly over the whole surface and in the grooves spiralling in one direction, but the grooves spiralling in the other direction were practically free of rouge, and even where the two sets of grooves crossed the two tracks of oil had not mixed.

By performing the same test, but allowing the spindle to run after the rouge was seen to appear at the other end, it was found that the rouge finally entered both streams of oil. The oil apparently traveled along the grooves that spiralled in one direction and then back along the other set of grooves. At the points of crossing, one stream of oil seemed to pass under the other.

So far the experiments had given every indication that the process was reliable, successful, and a commercial proposition, and one or two bearings produced by this process were incorporated in products sold. Shortly, however, a complaint was received that a bearing in a sifting and crushing mechanism composing part of a fiber drying stove, supplied to a gas mantle manufacturer, had seized. An examination revealed that it had not seized, but that it had warped, gripping the shaft and thereby preventing operation.

The bearing that had warped was in the end of a lever like that shown in Fig. 4, and it was discovered that because the metal at *B* remained plastic longer during casting than that at other parts of the bore, metal was drawn from this point by the other parts as they cooled, making it porous.

The metal at the surface of the bearing at *B* instead of being compressed by the rolling would simply be pressed back into the porous part, so that the bearing was unevenly stressed. It was the release of these stresses when the bearing became heated in use that caused distortion, as indicated by the dotted lines in Fig. 4.

Further experiments revealed that if sections near the bearing are not uniform or if for any reason the material in a casting is not homogeneous, the rolling process cannot be successfully applied. However, where conditions permit, the rolling process will produce a dense, durable and efficient surface.

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Abrasive in Cylinder Walls

A. W. FORBES
Forbes & Myers

JOHN R. GODFREY, discussing the question of whether or not abrasive is left in cylinder walls by the honing process, (*AM*—Vol. 76, p. 408) seems to think that abrasive should cause more wear. But why should it? Cast iron is of irregular structure. If we should drive particles of abrasive into the pores and into the soft places, then polish these particles to make a smooth hard wearing surface, why should that increase wear? Any particles of abrasive roll along the surface until they find some soft place which they can enter. Having entered the iron and stuck, any further rotation of the hone only polishes them to a smooth hard wearing surface. I have not examined any cylinders to find these particles, but I fail to see why anyone should object to them if they are there.

• NEXT WEEK •

Automobile body fabrication is primarily a series of welding operations. But no one method will fill all needs. The experience of the Seaman Body Corporation on Nash bodies is given in an enlightening article, "Five Welding Methods in One Shop."

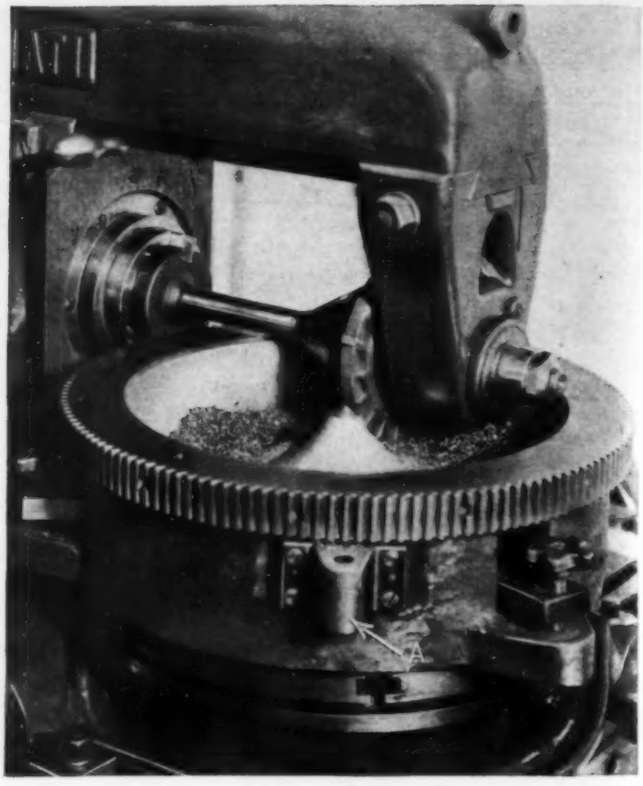
A new heat-treating department, installed by a prominent small tool manufacturer to meet the ever increasing demands upon his product, will be described. So many inquiries resulted from James R. Cornelius' article, "Metal Rolling in Mass Production," (Vol. 76, page 2) that the author has supplemented his previous presentation.

An article on the Bell Laboratories tells how telephone part gages are kept to a high standard of accuracy. A discussion on "Making and Keeping Crankpins Square," and "Facing a Concave Surface," round out the issue.

• IN A. M. •

Milling a Food-cutter Bowl

An irregular concave surface is produced with a standard cutter in a standard machine



BEFORE being milled, this cast-iron food-cutter bowl is turned in a lathe to true up both the rim and the bottom in order that it will fit the fixture accurately. Three clamps equally spaced about the bottom of the fixture and hold down on the lugs near the bottom of the bowl. The upper member of the fixture consists of a gear ring, which when screwed down up the lower portion clamps against the top of the bowl. The teeth on the circumference of the ring are cut so as to provide a means for screwing it down tightly. Effective clamping action is obtained by mounting a small pinion on a shaft, which fits into the bracket *A*, and engages with the teeth of large gear. Turning this shaft with a suitable wrench rotates the gear and hence locks the fixture.

A standard Cincinnati M-type miller with a 20 in. circular milling machine attachment is used. It is essential that the fixture be locked in such a position that a line through the axis of the cutter arbor represents a chord of a definite distance from the center of the fixture.

Depth measurements are obtained by means of special gage that fits across the top of the bowl after the cut is taken. One or two trial cuts are usually required to get the correct depth. Once this is established and the feed dials of the milling machine are set, the operation can be repeated until the cutters become worn sufficiently to throw the dimension off.

The axial position of the cutter is determined by a setting block. The cutter operates slightly off center so as to match the action of the cutting knives used in the finished bowl. In other words, the cutter mills the inside of the bowl in practically the same position as the mixing knives operate.

Two milling operations are required, one roughing and one finishing. The roughing operation is done with a cutter slightly smaller in diameter than that used for the finishing operation, but the relative position of the cutter and work is not altered.

The steps in machining may be described as follows:

1. The cutter is started rotating by throwing the spindle lever into starting position with work and fixture stationary.

2. The work is fed upward into the cutter until the proper depth is obtained for roughing or finishing, as the case may be.

3. The circular milling table power feed is engaged.

4. The machine is stopped after completion of the cut, and the knee is lowered sufficiently to permit the clamping ring to be removed.

A finishing and roughing speed of 82 r.p.m. is used with $6\frac{3}{4}$ in. diameter cutter. The roughing feed is $3\frac{7}{8}$ in. per minute while the finishing speed is $2\frac{7}{8}$ in. Floor to floor time per piece complete is approximately 14 minutes. This operation is performed in the plant of the Hobart Manufacturing Company.

•

Baths and Skin for Alloys

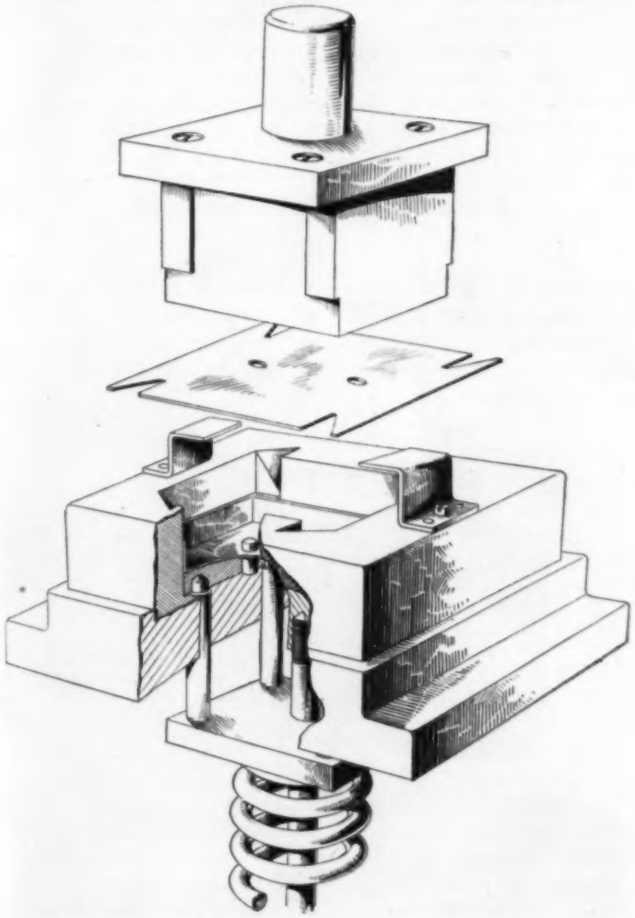
BY GROWING a metallic skin on some alloys and giving others gas baths, American industry may be able to save the loss of millions of dollars' worth of metal now going up in smoke from furnace chimneys. The department of engineering research of the University of Michigan has had experiments under way for three years, based largely on brass because this industry is the one in which non-ferrous metals are most extensively used in producing alloys. These alloys shrink during melting, due in large part to metal which boils into the air. Losses are high, because the brasses are five to ten times as costly as iron alloys, and also boil more readily. The "skin" which reduces losses are oxygen crusts, formed upon the liquid metallic surface, which blanket the volatile elements in the molten mass to retard escape. They are especially efficient in saving shrinkage of zinc alloys. But these skins are of little use for lead and tin. Here the gas bath is used, obtained by melting the alloys in an atmosphere in which some other gas instituted for oxygen, depending on the kind of alloy. Nitrogen is one of the most effective. The laboratory procedure for reducing shrinkage has been developed to the point where it can be used commercially.

IDEAS FROM PRACTICAL MEN

A Combination Folding and Bending Die

JOHN ROETHLISBERGER

Simple boxes can be formed economically in quantity by the method illustrated. Only two operations are required, blanking, and bending, or "folding." The blank, shown just below the punch, is cut in a compound die. The finished box, after the second operation, can be seen in place in the die. The spring-operated stripper carries two pilot pins that locate the blank. As the punch descends, all four sides are first bent to an approximate right angle with the bottom. The notched grooves at the corners then fold in the small ears to their proper lapping position as the punch continues its descent. The ledges at each corner of the stripper force the ears into a square corner as the punch finishes its stroke and hold them so that the body of the punch may complete the "ironing out."



Important elements of the die design are the grooves at each corner below the tapered portion into which the small ears and the punch ledges fit. These aid in maintaining box shape and guide the ears to their final position. Two Z-shaped scrapers or strippers remove the blank if it sticks to the rising punch.

Tool Steel Economies—*Discussion*

DONALD RAEBURN
Glasgow, Scotland

In an article under the title given above (*AM*—Vol. 75, page 497), Harry Shaw challenges the economy of the tipped tool and the toolholder, a subject that will interest many because of the continued advocacy of their use as a cost-cutting expedient. There is much to be said in favor of Mr. Shaw's arguments as to the waste of tool steel in the making of the tips. But when considering the question of tipped tools and toolholders, the class of work handled must be analyzed as to the advantage to be gained by their use, and the allocation of the tools and the toolholders to suitable operations.

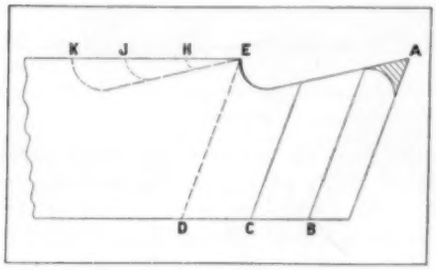
It must be remembered that the toolholders in use in many shops were designed by the foreman. Their construction is rigid and they are equipped with tools capable of absorbing the heat generated by cutting. With the modern type of toolholder of light construction, the size of the toolbit is smaller, having a greater danger of overheating and the consequent breaking down of the cutting edge. This, of course, emphasizes the care that must be exercised in the selection of holders.

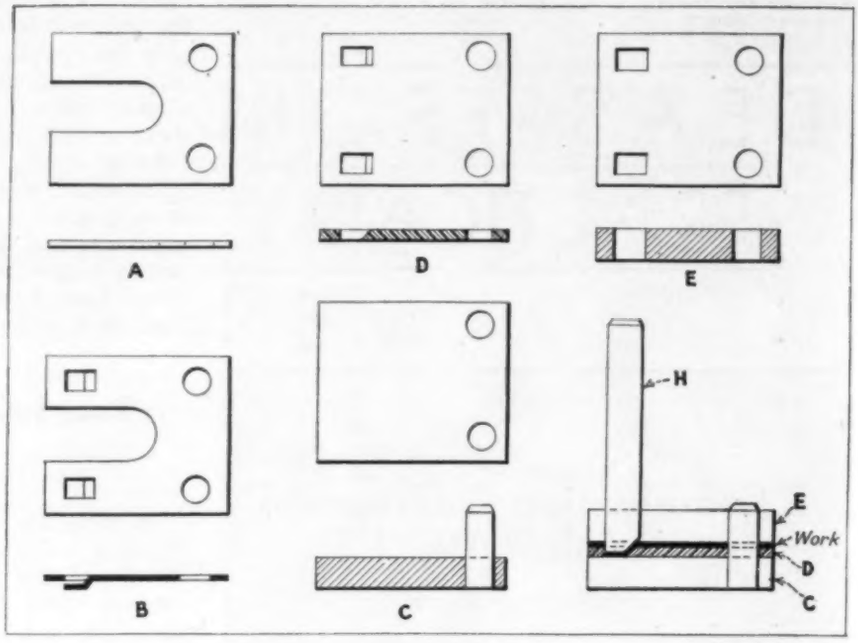
Apart from the easy grinding of tools secured in holders, there is the added advantage that short pieces of steel salvaged, as suggested by Mr. Shaw, can be used when the correct type of toolholder has been chosen. The economical handling of tool steel as outlined by Mr. Shaw, demands a thorough knowledge of the correct heat at which to draw down the steel, if the splintering referred to is to be avoided. Care is also required in the process to insure that the surface of the tool that lies against the tool slide is flat, if not, this face must be ground flat. Where the tool rocks on its base and is held by two or more clamps, it must be improperly strained in clamping.

A tool, such as is described above, must and usually does break between the holding screws, although a great deal depends upon where the irregularity of form exists. I have known forged-down tools to break directly under the clamps, as well as between the clamps, so that to derive the full benefit from the forging-down process, grinding the base of the tool is advisable. Mr. Shaw also deals with the question of tool grinding in relation to the waste of steel, and by his illustration explains a method practiced by a certain firm in conserving steel. The full lines in his illustration show the tool as issued from the store for use. The dotted lines indicate the shape of the tool after it has been ground several times.

The statement is made that the tool is weak at *A*

and is likely to break. It is not only likely to break, but before the breaking stage is reached it will cause chatter. No operator should be allowed to grind a tool in this manner, because the amount of grinding on the top face, assuming that the conditions are normal, is unnecessary. A tool ground in this way cannot perform its duties as a correct cutting medium. There must be a sufficiency of metal to support the pressure and the





weight of the cut. There must also be a body of metal sufficient to absorb the heat. In the tool shown by Mr. Shaw, the life of the cutting edge will be short, owing to the excessive heat generated by the friction of the metal particles being broken and crushed together against the shoulder *E*. This heat is also added to by the friction of the several particles flowing over the top face of the tool.

In the accompanying illustration is shown an alternative method of grinding. The shaded portion *A* has to be removed by grinding on the front face to *B*, with the minimum of grinding on the top face. After the tool has worn down to *C*, the wastage of steel that will take place in forming the new cutting angles *E* to *K*, as shown in the dotted lines, is represented by *C-D*. The formation of the top face of a new tool should take place on the various occasions when the tool is being ground, because of fracture or overheating.

That the subject dealt with by Mr. Shaw is worthy of attention is undoubted, for the incorrect grinding of tools is a waste of high-priced steel, waste in the life of the grinding wheel and in time in the changing of tools. These losses can be reduced by requiring the men to grind their tools correctly, or in having the tools ground for them.

A Tool That Paid for Itself

EMIL WITTMANN
Machinist, General Electric Company, Philadelphia Plant

The stamping *A* is made from $\frac{1}{16}$-in. half hard brass and is used in an electrical appliance. A change in design made it necessary to have two tongues on the part, as at *B*. A rush order called for immediate delivery of 800 parts for the new design.

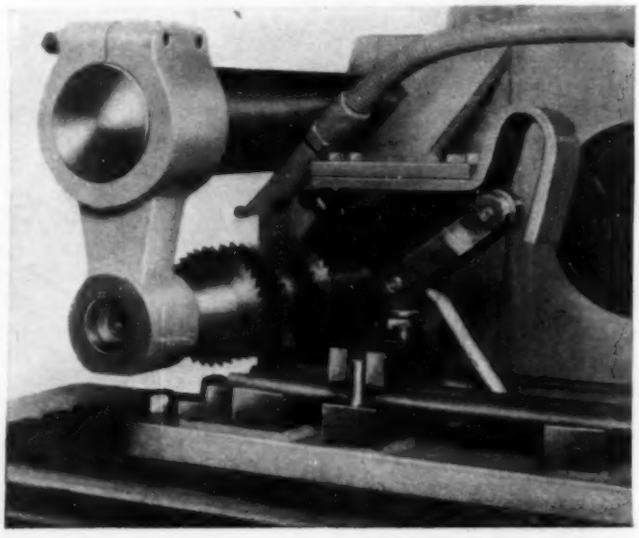
Since delivery could not be delayed until a new die was made, the inexpensive and temporary tool shown at the right was made for forming the tongues in parts already in stock. The tool for forming the tongues consists of the casehardened base *C*, which has two guide pins pressed in it; the hardened die-plate *D;* the casehardened guideplate *E;* and the punch *H*, all in correct relation to one another. Parts *D* and *E* are a sliding fit over the guide pins.

With the work in place, the punch, made of tool steel and hardened, is set in one of the rectangular holes in the guide-plate, and by giving it a blow with a hammer it forms one of the tongues. The other tongue is formed by the same means, the punch being set in the other hole in the guide-plate. The tool was made in 5½ hours, and it took the operator but 6 hours to form the tongues in the 800 pieces.

Steering Column Keyways

THOMAS O. FORD

Keyways are milled simultaneously in four steering columns by means of the set-up illustrated. A fixture for holding the columns is bolted to the table of a Kent-Owens milling machine. V-blocks support the work and



a stop locates it longitudinally. Between the blocks is an automatic clamping device which forms the novel feature of this operation.

The upper clamping bar is loosely held across the columns by two vertical pins fitted to the lower clamp. The work is held by two pivoted contact levers, which with the floating of the bar itself, constitute an equalizing device. At the top of the clamping bar an adjustable button is fitted into a tapped hole. Pressure on this button effects the clamping of the columns.

One end of a cam lever is supported by a 1-in. round steel bar securely bolted to the fixture base. When this lever swings about the support in a clockwise direction, its cam face exerts pressure on the button of the clamp bar. The other end of the lever carries a roller which follows a piece of heavy strip steel bent into a goose neck.

When the work is withdrawn from the cutters, the goose neck lifts the roller and releases the pressure of the cam. A helical spring lifts the upper clamping bar so the steering columns that have been completed may be replaced with others.

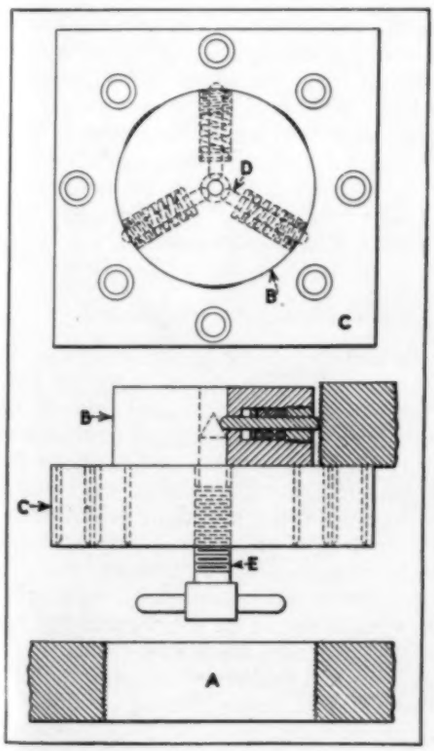
Then as the table advances the cam lever is swung downward firmly holding the work during the cut. Thus the operator has only to supply work to the machine.

Drill Jig With a Centering Device

CHARLES KUGLER

In the illustration is shown a jig that was made in a small tool-shop for drilling eight holes in a circle in flanges such as the one shown at *A*. The flanges were cut from boiler plate by a torch and were not machined. The tools were to be in a circle concentric with the central holes in the flanges within fairly close limits.

The jig was made from the two pieces of cold-rolled steel *B* and *C*. Part *B* is round and fits loosely in the central holes in the flanges. It carries the three centering and holding pins *D*. Part *C* is square and carries the drill bushings, also the screw *E* for operating the centering pins. When the screw is turned to the right, its conical point forces the centering pins outward, centering and holding the work. To remove the work the screw is turned to the left, releasing the pressure. As the conical point of the screw recedes, the pins are moved inward by springs.

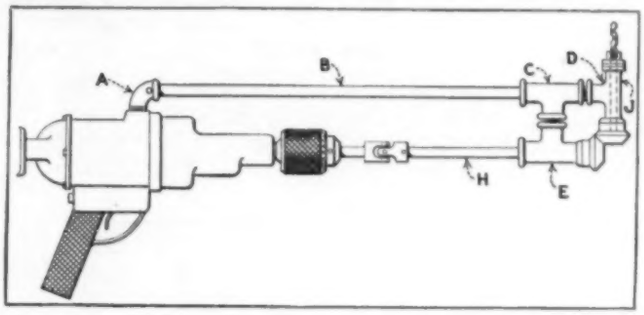


A Portable Drilling Outfit

WILLIAM COLCLOUGH

An extremely handy portable drilling outfit for reaching out of the way places that are inaccessible to the ordinary electric drill is shown in the illustration. This outfit was built by me in a short time from a universal joint, a pair of miter gears, some cold-rolled steel and some pipe and fittings, all of which were found around the shop.

The handle on top of the electric drill was removed and the "street" elbow *A* was screwed in its place. Into the elbow was fitted (not screwed) the supporting pipe *B*, on the other end of which are the two tees *C* and *D*, the tees being connected by a short nipple. Another tee, *E*, was attached to the tee *C* by a a nipple of suitable length to bring the center lines of both tees the correct distance apart. The adjoining ends of tees *E* and *D* were faced after assembly to match the miter gears, both of which



were pinned to the shafts *H* and *J*, the other end of shaft *H* being connected to the drill chuck through the universal joint. Shaft *J* passes through the tee *D* and is provided with a collar that acts as a drill holder, the drill having a flat spot ground on the shank for a setscrew to bear against.

The end of the tee *D* next to the collar was faced and a thrust washer was placed between it and the collar. After the shafts and the miter gears were aligned, the tees *D* and *E* were lined with babbitt. As the pipe *B* is a push fit in the street elbow, where it is held by a taper pin, all that is necessary to remove the outfit from the electric drill is to drive out the taper pin and loosen the grip of the drill chuck.

Filing Work Flat—*Discussion*

WILLIAM BRYCE
Sheffield, England

In an article under the title given above (*AM*—Vol. 75, page 496), J. T. Towlson, while endorsing the difficulty of doing such work, varies from his usual practice and seems to throw but little light on the subject. Merely to suggest first chipping a surface hollow is not enough, for some fitters would quickly make it convex again.

I am somewhat of an old timer, who in the past has had, and even now has to do such work. I have to deal with cast-iron coreboxes and patterns, both of which require that the sides be devoid of cavities, crevices, or hollows, so that the sand will leave them readily. In other words, it is the making of almost a toolroom

job out of rough castings. Some of this work closely resembles the keyway of a wheel, only it is in a more inaccessible place.

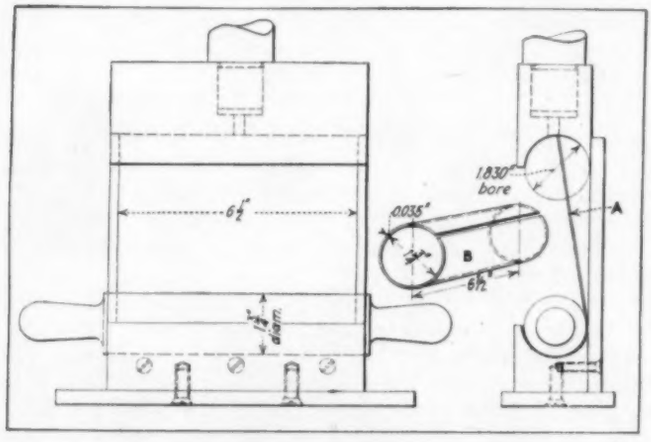
My method is to use a square, taper file, so that the fullness in the middle may gain contact with the work. File manufacturers will please note that square files well convexed toward the middle are a boon to mechanics for filing surfaces that are required to be flat. It is also necessary to use a flat scraper in conjunction with the file, so as to remove the high places left by the file.

As it is often difficult to detect and keep in view the high places, the edge of a piece of straight sheet brass should be rubbed on the surface to mark it. By such method, a surface almost as good as a straight edge can be obtained if necessary. But manufacturers must note that such work requires time on the man's part and patience on theirs, and the question of getting suitable machinery for the work must be faced.

Press Tools for Making Sheet-Metal Tubes

CARL G. ALT

Short tubes of sheet metal can be made quickly and in one operation by the simple tools illustrated. The lower member has a half-round groove in which rests a mandrel having handles at the ends. Two guide strips



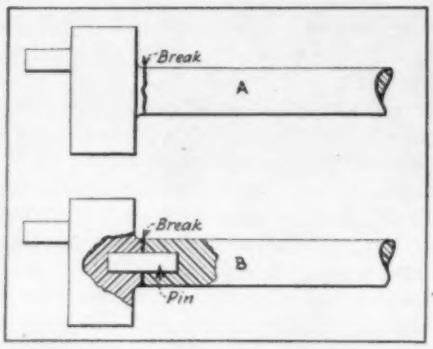
are attached to the back of this member. The upper member has a half-round groove to match the one in the lower member, and is provided with a shank to fit the press ram.

In operation, the stock *A* is entered as shown. As the ram descends, the blank is pushed part way around the mandrel, the protruding ends being closed together during the latter part of the stroke. At *B* a finished tube is shown. When the ram ascends, the operator lifts the mandrel out of its seat by the handles and strips off the tube.

Repairing a Broken Crankshaft

FRANK C. HUDSON

A punch-press crankshaft that was overtaxed broke next to the crankpin disk as at *A*. As it was needed in a hurry, it was repaired by boring both ends for a good-sized pin, as at *B* and welding the shaft itself at the break.



This ran for several months and finally broke again, partly in new metal this time. Similar repairs were proposed again until it was found that a new shaft could be made almost as cheaply as the repair.

SEEN AND HEARD

JOHN R. GODFREY

Where Thread Stripping Is Advantageous

Molded plastic bottle caps containing an internal thread are now a large production item. Such threads are ordinarily formed by a male plug which must be unscrewed from the piece when the latter is removed from the mold, an operation that requires some time. These threads need not be very accurate; consequently it has been found possible to strip the cap without unscrewing it and still leave enough thread to perform the required function. This is true especially when the thread is given some taper and more nearly approximates the Whitworth form with rounded root and crest. This method does not actually produce a broken or stripped thread since usually the cap is flexible and springs off.

Welding, Weldery, Weldex

With welding on the increase, a whole new nomenclature grows up. Several months ago, a supplier of welded pipe fittings gave his products the name of "Weldolets." A western oil-well tool shop has begun to call its welded pump, crane and tool parts "weldex." Now comes Austin Co. with its "weldery," making "weldings" for any purpose. Any of these terms is more to the point than "welded part," "fabricated part," "fabricated and welded," and other such clumsy expressions.

How Important Are Lead Tolerances?

The fitting of threaded parts is most important in all sorts of machine construction. But I cannot help feeling that we spend a lot of time and money on needless accuracy in lead where the thread engagement is short, as is usually the case. In some pipe fitting for oil well piping I recently saw gages that were being corrected because they were out less than a half thousandth in lead, in the length of the fit. Any material used for piping will flow more than that and no one be the wiser. In fact there are a number of thoroughly practical engineers who believe that the way to get the right kind of a thread fit is to deliberately plan for a flow of metal when the parts are screwed together. This is something for the National Screw Thread Commission to consider when it meets again.

SHOP EQUIPMENT NEWS

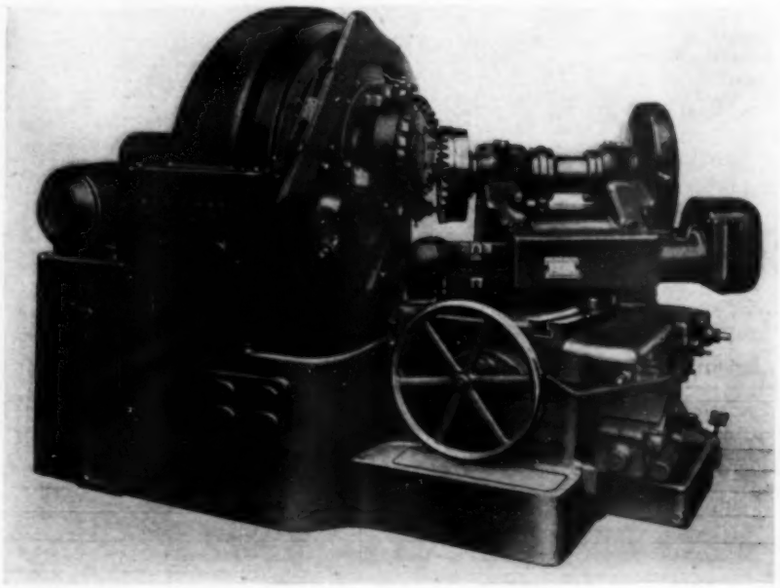
Gleason No. 16 Spiral Bevel Gear Generator

A COMPLETELY new machine, the No. 16 spiral bevel gear generator, is being manufactured by Gleason Works, 1000 University Ave., Rochester, N. Y., to replace its 15-in. spiral bevel gear generator. Among the features are an improved type of cutter cradle, new reversing and indexing mechanisms, claimed to be free from noise and vibration, straight-line movement of the work into the cutter, and more liberal use of anti-friction bearings. These improvements are claimed to make the machine more rigid and to enable it to be operated at higher feeds and speeds.

The machine consists of three major parts: frame, workhead and cutter cradle. The frame is a heavy one-piece casting, and the cutter cradle is entirely contained in a full circular housing bolted to the frame. The workhead is bolted to a large sliding carriage moving at right angles to the root line of the gear being cut. The carriage is held in close alignment by gibs adjustable for taking up wear. Straight-line movement of the work, a new feature of this type of generator, is an advantage because the work may be moved more rapidly into and away from the cutter, thereby reducing materially time required for indexing. A large handwheel is provided to move the entire unit for chucking or removing the work or for inspecting the first tooth for size and finish.

The work spindle is of large diameter to give increased bearing area and at the same time to allow a choice of bore sizes to accommodate large pinion shanks. The design of the spindle has been changed to permit mounting the work nearer the spindle bearings to reduce the overhang between gear blank and bearing.

Main support of the cutter cradle is furnished by a circular housing bolted directly to the frame. The cradle is of full circular type and is thus held with the same rigidity in all positions of the generating roll.



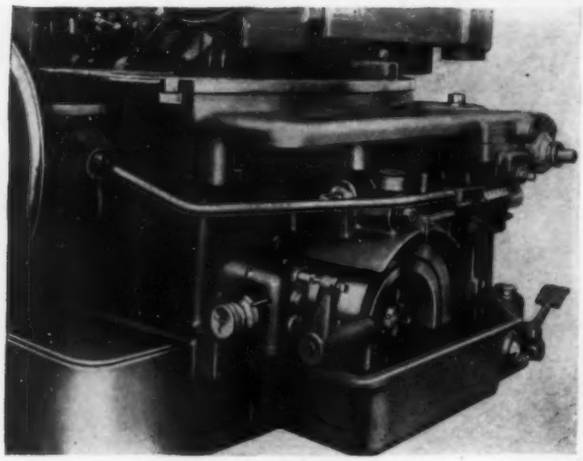
Spiral bevel cutter and cutter spindle mounting of the No. 16 machine

Drive to the cutter spindle is positive without sliding shafts. Adjustments are provided for setting the cutter for the spiral angle of the gear to be cut and for taking up cutter wear. In addition, the cutter is adjustable angularly in two different planes to provide a means of altering the tooth bearing as desired and to make it possible to use one cutter for a variety of jobs. The entire construction is designed to provide rigid support for both cutter spindle and cutter.

A 42-in., 300-tooth dividing wheel controls the generating motion of the cutter cradle. This wheel is of the split-type and to insure accuracy is hobbed in place. It is first rough hobbed in the usual manner, then several light finishing cuts are taken, the two parts being shifted until required accuracy is obtained.

The cutter spindle is mounted on matched preloaded bearings to eliminate radial and axial deflection. Direction of rotation of the cutter spindle is easily changed for the opposite hand of the cutter by means of a lever-controlled clutch. To insure concentricity, the nose of the spindle is ground with the spindle mounted on its own housing.

Indexing and reversing mechanisms are placed conveniently and are provided with hydraulic dampeners to enable them to operate smoothly even at high speeds. The number of teeth to be cut is controlled by index change gears constantly in motion since they function in the generating train. This arrangement provides a large final reduction to give more accurate control of the generating motion. The large index wheel controls the work during the indexing and cutting op-



Feed cam, automatic stop and work-head clamping handle on the Gleason No. 16 spiral bevel gear generator

erations. This wheel is of the split-type and is hobbed in place, each half being shifted between cuts until required accuracy is obtained.

Most parts of the machine are automatically lubricated. Parts not supplied by the automatic system are lubricated with a manually operated plunger system. Both systems are equipped with filters. The cutting oil or coolant pump has a capacity of 5 gal. per minute. Both cutting and lubricating oil pumps are of the geared type. A large chip pocket is provided in the machine frame where chips are drained of coolant. When the machine is started, the main drive motor will not operate until the pumps have built up sufficient pressure to supply coolant to the cutter and to lubricate the entire machine. Should the oil supply become too low, the same mechanism will stop the machine. This does not prevent "jogging" the machine when setting up, as an across-the-line switch is provided for this purpose.

The machine is driven by a Gleason coupled spiral bevel motor drive. An N.E.M.A., 3-hp., 1800 (or 1500) r.p.m. motor is required for the drive and may be furnished by the customer or purchased with the machine. The ¾-hp. motor for the lubricating and cutting oil pumps is furnished with the machine. A magnetic controller and pushbutton with stop, start and jog positions are used for the main drive. An overload relay protects the machine from damage if the cutter is overloaded. All electrical equipment, except a portable switch button, is built into the machine.

Included in the equipment furnished with the generator are: Sets of index and ratio change gears, cradle roll change gears, cutter speed change gears, and feed change gears, an indicator for truing the cutter, cutter length gage and gage proof block, necessary wrenches and screw drivers, and a cabinet for loose parts.

For quantity production, it is recommended that both gears and pinions be roughed on spiral bevel roughers and that this new machine be used only for finishing. New style roughers have been developed upon which gears may be roughed at considerably lower cost than on a generator. If the quantity of gears to be cut is small, they can be both roughed and finished on this machine of course. No special equipment is required for roughing, but a double-track feed cam, furnished as extra equipment, is necessary. To change from roughing to finishing on this cam it is only necessary to turn a crank which shifts the roller.

In operation, work is alternately fed into the cutter to cut a tooth space of the blank, then withdrawn, and the work indexed for cutting the next tooth space. As the cutter rotates with the blank to produce the lengthwise tooth shape, a relative rolling generating movement is produced simultaneously between cutter and blank to generate correct tooth profile. This rolling motion consists of a slow rotation of the cradle which carries the cutter in timed relation to a corresponding rotation of the work spindle, and corresponds to the motion of a gear rolling with a crown gear of which the cutter represents a tooth. This succession of operations continues until the last tooth is cut when the automatic stop acts to stop the machine and prevents re-cutting a tooth. After the work is mounted on the spindle, operation of the machine is completely automatic. Work is moved into and away from the cutter by a feed cam which runs in a bath of oil and also supplies cam ways and rollers with lubricant.

SPECIFICATIONS

CAPACITY

Longest cone distance, 30-deg. spiral angle 12-in. cutter	9 in.
Largest pitch angle, shafts at 90 deg.	82 deg. 53 min.
Smallest pitch angle, shafts at 90 deg.	7 deg. 7 min.
Extreme ratio, shafts at 90 deg.	8 to 1
Largest pitch diameter	
8 to 1 ratio gear	18 in.
2 to 1 ratio gear	16 in.
1 to 1 ratio	12⅜ in.
Largest pitch, Gleason System	2½ D. P.
Maximum full depth	⅞ in.
Longest face	1¼ in.

WORK SPINDLE

Diameter of taper hole, large end	2.292 in.
Taper per foot	½ in.
Depth of taper	6 in.
Diameter of hole through spindle	2 1/16 in.
Spindle nose to center line of machine	2½ to 13 in.

6, 9 and 12-in. cutters can be mounted on the spindle.

SPEEDS AND FEEDS

Feeds (time per tooth)	12 to 73 sec.

Cutter Speeds (ft. per min.)

6-in. cutter	9-in. cutter	12-in. cutter
64 to 220	67 to 236	73 to 228

Floor space	71 x 104 in.
Net weight, lb. (est.)	11,500

Aetna Four-Part Oil Seal

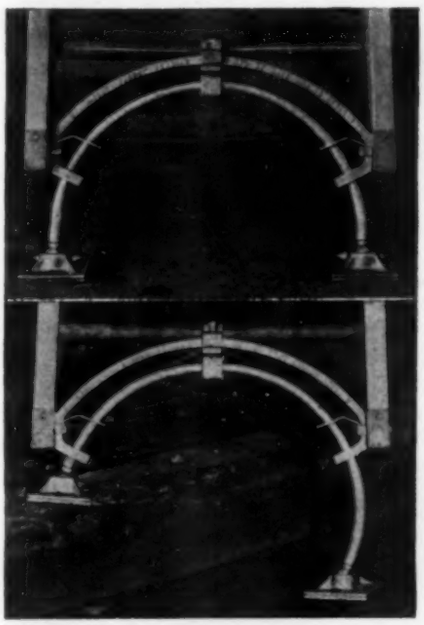
A four-part oil seal has been announced by the Aetna Ball Bearing & Mfg. Co., Chicago, Ill. This self-contained unit can be slipped into or out of position. It consists of an outer shell of steel ground on the outside diameter, and this shell houses the seal cushion, pressure plate and steel retainer. The seal cushion consists of cork of which the interstices are hermetically sealed. This pneumatic seal cushion automatically expands and contracts laterally with changing temperature of the shaft or lubricant and thus remains oiltight. It

is non-hygroscopic and is impervious to water.

The deflector-pressure plate of fiber deflects oil from the seal proper and serves to maintain a constant pressure upon the pneumatic cushion and a uniform pressure over the periphery of the seal, meanwhile relieving it of extraneous internal pressure. The seal is claimed to hold oil as well as grease. Sizes from ½ in. inside diameter and up are available.

Shur-Foot Leveling Device for Ladders

A device that automatically compensates for variations in footing beneath ladders is being produced by Ruse Mfg. Co., 312 Dean St., Akron, Ohio. As can be seen, the semi-circular leveling device carries two ball



and socket joints at its base, upon which pads are fitted. This permits adjustment both for slope and for varying ground conditions. Side spring-type locking devices permit the ladder to be set on any surface and locked instantly when the weight of the ladder is thrown on the device. An anxiliary steel spring at the top keeps proper tension for free leveling and locking. The shoes are also of aluminum and are available with three different types of bottom, either a Carborundum abrasive, Goodrich patented rubber vacuum cup for use on smooth surfaces or cork inserts. The device has been approved by Underwriters' Laboratories.

Lyon Steel Tool Cabinet

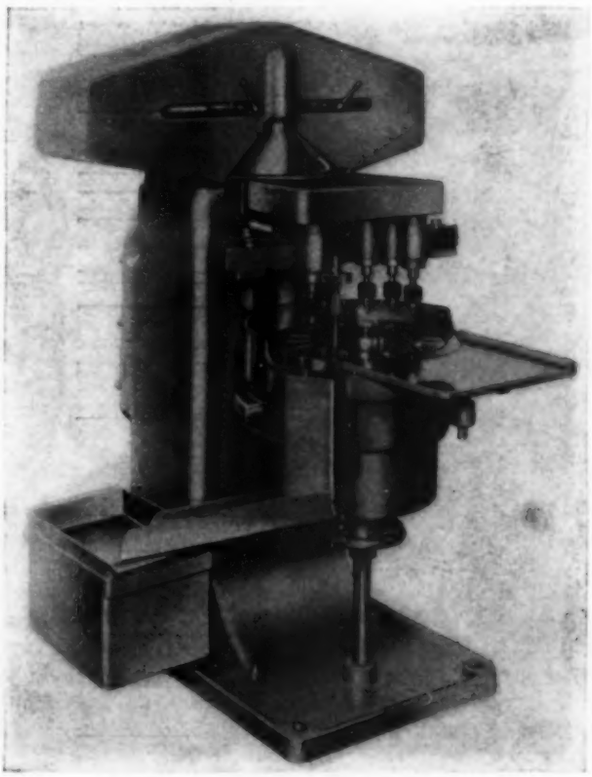
A steel tool cabinet is announced by Lyon Metal Products, Inc., Aurora, Ill. The cabinet is fitted with three shelves and top and bottom trays. A

lock is provided. Finish is olive-green baked enamel. Width is 21¼ in., depth 15½ and height 34 in. Shipping weight, 102 lb.

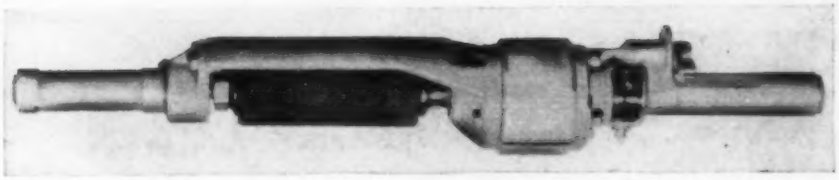
Hydro-Machine Reversing-Type Tapping Machine

A new reversing-type tapping machine is being manufactured by Hydro-Machine & Tool Co., Inc., 488 John St., Bridgeport, Conn., which is claimed to present a radical departure in that no clutches or gears are employed to reverse the spindles for performing the threading operation and backing out of the tap. Instead of being driven by clutches and a gear, the spindles are positively driven in either direction by means of a hydraulic piston, which is connected to a rack meshing with a train of gears, the piston being double-acting. Travel of the piston is adjustable to give any desired number of revolutions to the tapping spindle in either direction within the capacity of the piston, which in this machine is 15 revolutions of the tap. This can be increased if desired.

The tapping head is mounted on V gibs and one overhead pillar support and has a wide range of adjustment. Spindles are made of hardened and ground tool steel and mounted on high-grade ball bearings. Spindles are positively driven but so arranged with a compensating head that the tap follows its own lead, permitting the use of different size taps in the same machine. The maximum number of spindles on the standard machine is 12. All gears are of the helical type with wide face. Motor and pump are mounted within the base. The indexing and locking mechanisms are also operated hydraulically and are controlled from the main drive. The table is adjustable by a handwheel. Speed is controlled from a dial and ranges from 1 to 50 cycles per min. Capacity is eight $\frac{5}{16}$-in. taps in ¼-in. steel. Production time is from 20 to 80 pieces per min. by hand feed, which can be increased by using a hopper feed. Floor space required is 42x57 in., and the weight is approximately 2,000 lb. Drilling, milling, spinning, screwsticker and light forming attachments are available on order.



Indexing, locking, tapping and reversing are all performed hydraulically in this tapper, which can have as many as 12 spindles

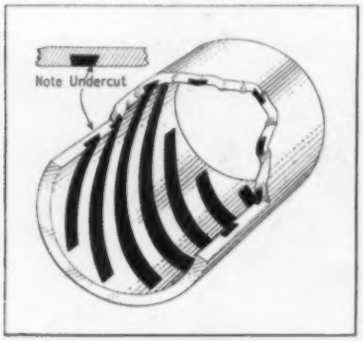


CP No. 66 Rotary Pneumatic Rod Grinder

A rotary pneumatic rod grinder for grinding and smoothing any wide surface that is to be smooth finished is being manufactured by Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. It was designed particularly for use in locomotive and railway shops in grinding locomotive side and main rods, valve motion rods, grinding welds on side rods, smoothing jaws in main rods for new brasses, grinding relief on brasses when fitted to rods, grinding frame pedestal jaws and grinding holes in frames for refitting brake pins. A number of similar uses have been found in other industries. Features of the machine include governor control, a removable air strainer, heavy-duty radial and thrust ball bearings for the wheel, renewable hardened rotor liner, rotor mounting on overcapacity ball bearings, and a special design to cut vibration. The machine takes a $2\frac{1}{2} \times 6 \times \frac{3}{4}$-in. wheel, is $27\frac{1}{2}$ in. long over-all, has a light speed of 5,800 r.p.m., and a net weight complete of $15\frac{1}{2}$ lb.

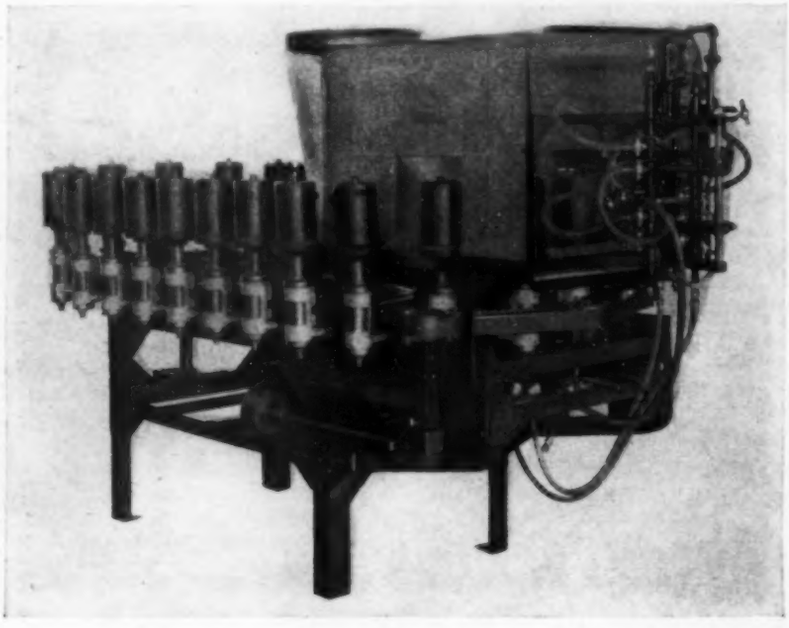
Williams Spiral-Type Oil-Less Bearings

Designed for sliding or oscillating motion with the axis either vertical or horizontal, a spiral-type oil-less bearing has been developed by E. A. Williams & Son, Inc., 111 Plymouth St., Jersey City, N. J. These bearings will operate at speeds to 2,500 r.p.m., depending upon load, and at temperatures not above 400 deg. F. The grooves are machined with an undercut to insure retention of the graphite, and are arranged to provide thorough lubrication with sacrifice of a minimum amount of bearing surface. The clearance used with these bearings varies from 0.001 to 0.002 in. greater than for plain bearings.



DeVilbiss Automatic Generator Finishing Machine

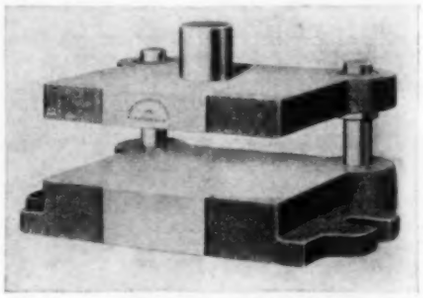
Hand-operated spray guns have long been used for industrial finishing. Automatic spray equipment, a recent innovation, is however gaining a place because in certain installations it reduces manufacturing costs, saves material and cuts labor charges. Equipment of this sort is now being manufactured by DeVilbiss Co., Toledo, Ohio. Illustrated is a generator finishing machine which is entirely automatic and requires no spray operator. Generators pass under a group of DeVilbiss automatic spray guns which spray the finishing material over the product in the required manner. Generators are loaded automatically onto an endless chain which carries them through the spray painting compartment. According to the manufacturer, a variety of similar specialized set-ups have been constructed.



Danly Commercial Die Sets

A new, low-priced line of standardized die sets and shoes, to be known as the Danly "Commercial" line, has been introduced by Danly Machine Specialties, Inc., 2112 S. 52nd Ave., Chicago, Ill. The new line supplements but does not replace the standard Danly precision line, which is being retained in its entirety.

These sets are designed and intended to handle economically requirements of from 300 to 300,000 pieces. It is thus planned to give tool rooms and tool shops a line of units to meet present-day reduced production rates. Shoes and sizes are identical with those of the Danly precision die sets, the change being only in guide posts and bushings. Guide posts are of hardened manganese steel and bushings of special nickel alloy to prevent binding and to minimize wear. Parts for the sets are stocked at the five Danly plants, each set being thus built up to order from standardized parts. Commercial sets can be converted to the precision sets by changing pins and bushings. Catalogs and folders are available.



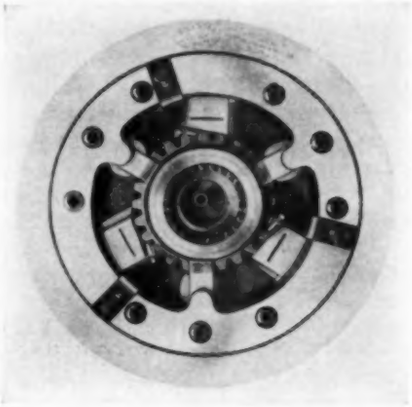
General Electric Pyrometer Lamp

A pyrometer lamp claimed to measure within 5 to 10 deg. C. of the temperature of a furnace has been developed by the Nela Park Lamp Development Laboratories of General Electric Co., Cleveland, Ohio. It consists of a black-coated, pear-shaped bulb containing an inverted U-shaped carbon filament and a small eyelet about $\frac{1}{8}$ in. apart. These are mounted midway between two windows in the bulb and in such a manner that the center of the eyelet and horizontal portion of the filament are on a line of sight between the centers of the windows. When measuring the furnace temperature, the lamp is held as near the furnace door as convenient and the part to be measured is viewed through the windows of the bulb. Brightness of the filament is adjusted by varying the current through it by means of a rheostat until it matches that of the furnace. Then the filament current is read on an ammeter. Temperature corresponding to this current value is read from a calibration chart. The advantage of the eyelet is that it indicates the calibrated portion of the filament and enables the operator to keep his eye focused on the plane of the filament at the time it blends with the background.

"Cimatool" Bolender Grinding and Boring Chuck

A grinding and boring chuck developed especially for helical gears has been announced by City Machine & Tool Works, East Third at June, Dayton, Ohio. Although designed principally for helical gears, it may also be used for various sizes of spur gears.

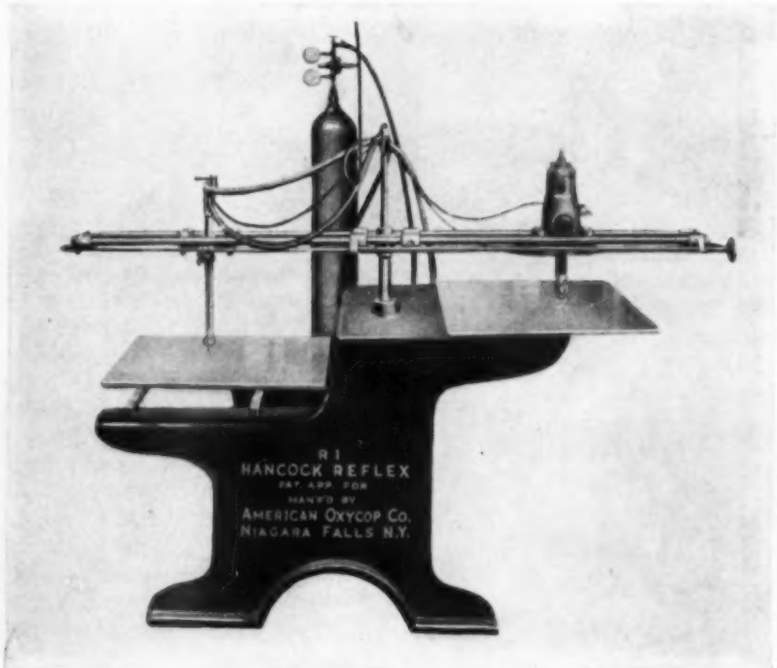
On spiral gears, the chuck is loaded in the conventional manner. When the operator releases the drawbar, instead of the jaws chucking immediately, the part is automatically brought back by three fingers or locking cams which may be seen in the photograph. These fingers turn from a position at one side to the locking position in which they are shown, then pull backward to bring the backside of the gear, which has been machined or "green ground" at right angles with the gear face, firmly against three cross-bar buttons located in a parallel plane in the chuck body. This automatic method is claimed to avoid previous difficulties in chucking narrow-faced helical gears in a true vertical plane. In



this chuck also, though the gear is held back firmly to prevent any forward or backward motion, it is permitted a sidewise movement in every direction so that in the second stage of the automatic operation the jaws of the chuck may come in and center the gear accurately. The use of long pins as locating pins permits chucking on the pitch diameter and eliminates any necessity for grinding or locating from the outside diameter of the gear. Other means of locating such as flexible pins, cage of balls, or tooth segments, can be utilized in this chuck where considered desirable.

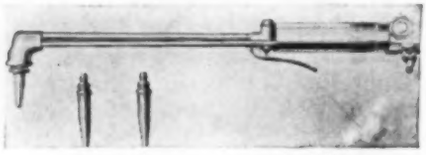
Hancock "Oxycop" Flame-Cutting Machine

The Hancock coal-gas, flame-cutting machine, an English invention, is now being manufactured by American Oxycop Co., Niagara Falls, N. Y. The machine operates with ordinary illuminating gas under normal pressure (no booster being required) in conjunction with oxygen, with gases having heating values as low as 500 B.t.u. per cu.ft. The manufacturer claims speeds of 12 in. per min. through 1-in. steel, and 9 in. per min. through 3-in. steel. The sharp edges of the cut and smooth surface are said to enable dies to be cut with an allowance of only $\frac{1}{16}$ in. for finishing. Special attachments are available for circle cutting and for working either semi-automatically or full automatically. Maximum capacity of the machine is 8-in. steel, which is claimed to be cuttable without change in the chemical composition of the steel at the cut face. Machines are supplied from 24x18-in. to 15x4-ft. capacity.



Milburn Type NVM Standard Cutting and Welding Torch No. 960

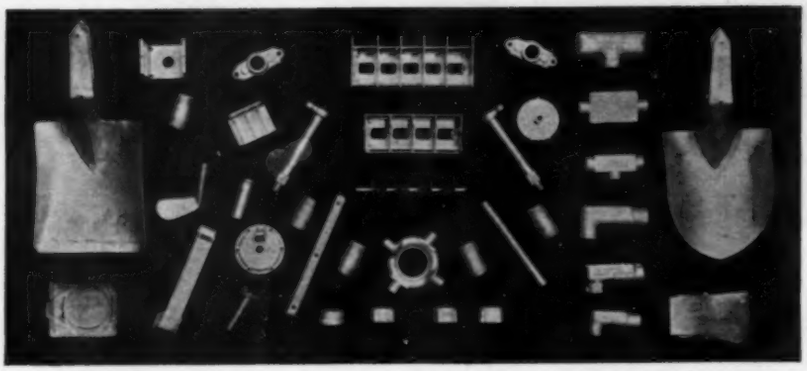
A Type NVM cutting and welding torch is now being added to the line of Tips, Inc., 515 Cathedral St., Baltimore, Md. This torch has been improved in design and will cut or weld any normal thicknesses of metal within range of the process, the torch being prepared for welding by changing the tip. Valves and base of the torch are of forged bronze. Tubes are triangularly arranged to give increased transverse strength. The high-pressure valve is operated with



an improved lever underneath the torch. All replacements can be made without disassembling the torch, as important parts are all accessible from the outside. The 90-deg. head of this torch is designed to take standard Type NV conical seated tips.

Improved Premier Bench Grinder

Premier ball-bearing bench grinders, manufactured by Sunlight Electrical Mfg. Co., Warren, Ohio, are now being equipped with a flange guard known as a "Wisconsin Guard." The guard can be removed when buffing or polishing instead of grinding. The motor is a split-phase, a.c. type starting with less than 15 amp. of current. Two sizes are available, the ¼-hp., 1,750-r.p.m., and the ½-hp., 3,600 r.p.m. both equipped with an 8-in. ball-bearing motor. Tool rests are now adjustable in all directions. The unit has a toggle switch in the base.



"Cadux" Cadmium-Plating Process

Rust-proofing of steel with a silver-white coating is obtained by the "Cadux" plating process developed by the Hanson-Van Winkle-Munning Co., Matawan, N. J. The silvery bright color of the deposit is of advantage because of its pleasing appearance. The color is due to the fine crystalline structure of the deposit, which increases the protection of base metals such as iron and steel when they are exposed to atmospheric corrosion. The double result of a bright deposit for ornamentation and a closed homogeneous coating for protection against corrosion is claimed to give "Cadux" plating an advantage.

Current densities ranging from 10-20 amp. per sq.ft. can be used in still tanks or automatic plating apparatus. A deposit obtained in 10-15 minutes will be sufficient to obtain a rust-proof coating. For lighter coatings on steel that is to be held in storage a deposit from 2-3 minutes is all that is required.

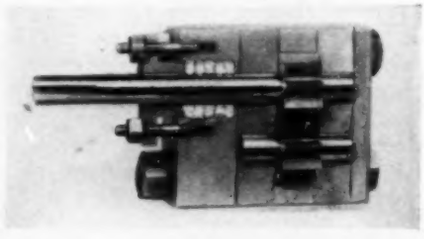
A "Cadux" solution is claimed to be simple to operate, and to have excellent cathode efficiency with consequent low power cost per unit weight of deposited metal. The throwing power of the solution is high, so that recesses and deep-cut threads are thoroughly coated. This also insures a uniformity of thickness of deposit which is essential in rust-proofing.

Accurate methods have been developed for rapid analysis of solutions so that a control of the solution can be had that will maintain it at its highest efficiency.

Many articles treated by the Cadux process will require no further treatment. However, some classes of products may require a maximum luster such as that obtained by buffing. For this work the company has obtained patent rights of the "Nitri-Brite" dip process, which produces a luster closely approximating that of hand-buffed work. The process consists of subjecting the work, after it comes out of the Cadux solution and before drying, to the action of a dilute aqueous solution of an oxidizing agent. This dip increases the brightness of the deposit and removes any clouding that might come from inequalities of current density on irregularly shaped pieces. The dip prevents staining of the plated work that ordinarily occurs from handling during assembly.

Northern XE Series Nitralloy Rotary Pumps

An XE series of Nitralloy rotary pumps is being introduced by Northern Pump Co., Minneapolis, Minn. These use the same laminated plate construction worked out in the two smaller series XA and XD. Nitralloy pumps are now available with capaci-



ties from ¼ g.p.m. to 42 g.p.m. at 1,200 r.p.m., the range of the new series being 14 to 42 g.p.m. at 1,200 r.p.m.

Nitralloy is used to make the pump suitable for all types of oil services, including handling of dirty crude oils and distillates at high pressures. For non-lubricating oils, the XE series is equipped with Nitralloy plate bearings as shown. Roller bearing pumps handling clean lubricating oil would be suitable for pressures up to 1,600

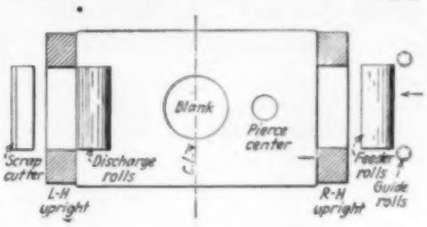
lb. on continuous service. The pump body is of solid steel with integral Nitralloy plate bearings. The cylinder itself is also of Nitralloy, as are the gears and shafts. The pump is held together by four steel dowels and the standard stuffing box may be replaced by double-depth boxes or patented types, if desired. Helical gears may be obtained for the pump.

• EQUIPMENT ADAPTATIONS •

Recently Developed by the Makers

Toledo Double-Crank Press with Special Double-Roll Feed

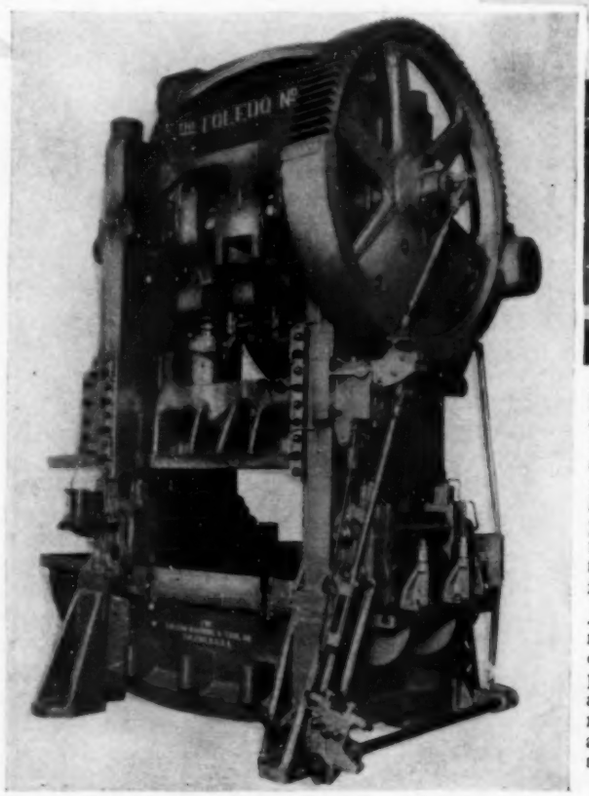
Recently the Toledo Machine & Tool Co., Toledo, Ohio, built a standard double-crank press weighing about 70,000 lb. with 60 in. between the uprights, and with such modifications as necessary to accommodate the feed mechanism illustrated. This feed mechanism is of the double-roll type. At the extreme left of the press outside of the frame there is an independent slide to accommodate a scrap cutter. The mild steel stock is approximately 21 in. wide and $\frac{3}{8}$ in. thick. It enters the press by means of the rollers outside the frame at the right. The second set of rollers is placed inside the housings. This construction permits the use of a comparatively narrow press, bringing the heavier part of the work directly under the center of the slide and allowing the scrap cutter to be placed close to the frame. Guide rollers will be

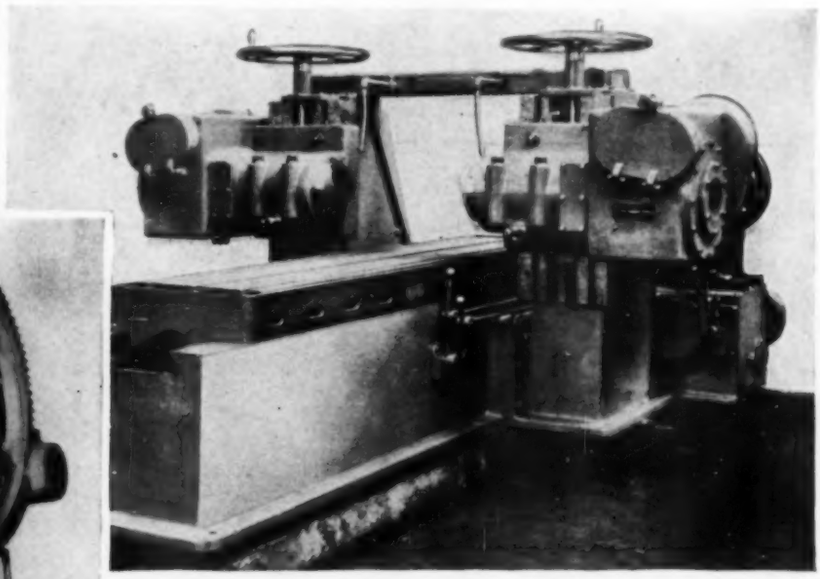


seen for locating the stock correctly. The first operation punches a small hole and the second operation in a progressive die blanks the large hole. As the stock goes through the second set of rollers it is cut up into convenient handling lengths. The mechanism is entirely automatic.

Fitchburg Special Miller for Crossheads and Driving Boxes

The Fitchburg Engineering Corp., Fitchburg, Mass., has adapted its milling head (*AM*—Vol. 73, p. 683) to a special milling machine arranged for repair work on locomotive crossheads and driving boxes in a locomotive repair shop in Massachusetts. This milling head is a self-contained power unit which may be operated in any required position, thus reducing the mechanical difficulties in producing special production milling machines. The head can be arranged for permanent mounting or placed on suitably gibbed slide surfaces so it can be adjusted or fed along the supporting member as required. The spindle speed is varied by means of pickoff gears.





Left—A standard Toledo double crank press with necessary modifications to accommodate a double-roll feed mechanism handles 21 x $\frac{3}{8}$-in. steel plate. This permits a narrower machine for the job and closer mounting of the scrap cutter

Above—A self-contained milling head that can be operated in any required position has been adapted to a Fitchburg milling machine to make a unit for repairing locomotive crossheads and driving boxes

• TRADE • PUBLICATIONS

CLUTCHES. Conway Clutch Co., 1543 Queen City Ave., Cincinnati, Ohio, has issued Bulletin K-32, covering its one-revolution clutch, which was formerly illustrated in compression clutch bulletin No. 35.

ENGINES & PUMPS. Worthington Pump & Machinery Corp., Worthington Ave. at Warren St., Harrison, N. J.,

has issued a number of publications, including the following: Stationary Diesel Engines, 4-cycle Direct-Injection Type—8-page Bulletin S-500-B5A covering 50 to 150-hp. sizes; 6-page Bulletin S-500-S5 covering 150 to 300-hp. sizes; 12-page Bulletin S-500-B7 covering 225 to 450-hp. sizes; 6-page Bulletin S-500-S4 covering 300 to 600-hp. sizes; 6-page Bulletin S-500-S6 covering 375 to 1,000-hp. sizes; Marine Diesel Engines, 4-cycle Direct-Injection Type—8-page Bulletin S-500-B8 covering 50 to 150-hp. sizes; Gas Engines, Vertical 4-cycle Type—6-page Bulletin S-550-S1 covering 60 to 180-hp. sizes; Portable Air Compressors—4-page Bulletin W-850-B5 showing mechanical features, and mountings on trailer, truck, tractor, railroad car, mine car and wood skids; Vertical Sump and Irrigation Pumps—4-page Bulletin D-450-B7 showing illustrations of installations, cross-section views and table of capacities and sizes; Centrifugal Pumps, Monobloc Type (bolted to motor frame with impeller mounted on motor shaft)—8-page Bulletin W-321-S1A showing cross-section view, rating tables, and pump combinations with motor characteristics.

FLEXIBLE COUPLINGS. Diamond Chain & Mfg. Co., Indianapolis, Ind., has published Catalog No. 11 on construction features and ease of installation and disconnection of Diamond couplings, illustrating and tabulating all types and sizes in the line, and giving data on the selection and installation.

MAGNETIC SWITCHES. General Electric Co., Schenectady, N. Y., has issued five bulletins to supersede earlier ones. They are: GEA-19G on CR7006-D7B and -D7F Magnetic Switches for a.c. motors; GEA-1565, superseding GEA-83A, 813 and 844A, on CR7009 Magnetic Reversing Switches for a.c. motors; GEA-1580, superseding GEA-405A, on Single-speed Induction Motors for Elevator Service; GEA-1587, superseding GEA-1419, on the CR7008 Combination Magnetic Switch for induction motors. GEA-1588 is a new bulletin on Explosion-proof CR7006 Magnetic Switches for Class I, Group D, Hazardous Locations of a.c. motors.

TRAMRAIL. Cleveland Electric Tramrail, division of Cleveland Crane & Engineering Co., Wickliffe, Ohio, has issued a bulletin entitled "Cleveland Tramrail has proved its Value in the Automotive Industry," listing applications of the tramrail in automobile manufacturing and assembly plants.

WELD EXAMINATION, Murex Welding Processes, Ltd., Ferry Lane Works, Forest Road, London, E17, England, has issued booklet No. M3/R on "M.W.P. Welds Under the Microscope." Photographs of welds in various metals and alloys are shown, together with discussions of physical properties.

POWER HAMMERS. Nazel Engineering & Machine Works, 4047 N. 5th St., Philadelphia, Pa., has issued a bulletin "Indorsed by Over 1,050 Firms in 66 Different Industries" which lists users of Nazel motor-driven power hammers and principal sales points of the line.

• PATENTS •

APRIL 12, 1932

Metal-Working Machinery

Torch Cutting Machine. James L. Anderson, Tenafly, N. J., assigned to Air Reduction Co., Incorporated. Patent 1,853,026.

Machine for Making Wire Splice Clips. Clarence J. Keller, Anderson, Ind., assigned to Delco-Remy Corporation. Patent 1,853,062.

Controlling Means for Automatic Lathes. Friedrich Mulka, Berlin-Lichtenberg, Germany. Patent 1,853,074.

Electric Welding Machine. Edmund J. Von Henke, Chicago, Ill., assigned to American Electric Fusion Corporation. Patent 1,853,101.

Saw Filing Machine. Frank Wellington Wardwell, Jr., Cleveland, Ohio, assigned to The Wardwell Manufacturing Co. Patent 1,853,245.

Tumbling Barrel. Clyde J. Bristow, Chicago Heights, Ill., assigned to Zouri Drawn Metals Co. Patent 1,853,297.

Gear Lapping Machine and Method of Lapping Gears. Henry Follett Hodgkins, Syracuse, N. Y. Patent 1,853,354.

Molding Machine. Theodore C. Mann, Rockford, Ill., assigned to Mattison Machine Works. Patent 1,853,442

Electric Welding Apparatus. Elvin S. Goodspeed, Detroit, Mich., assigned to General Motors Corporation. Patent 1,853,609.

Method of and Apparatus for Generating the Convolute Teeth or Threads of Worms and the Like. Oliver G. Simmons, Lakewood, Ohio. Patent 1,853,643.

Pipe-Shaping Machine. Lionel A. Carter, Webster Groves, Mo., assigned to Lehmann Machine Co. Patent 1,853,660.

Method of and Means for Grinding Cutter Blades. Preston W. Cummings, Rockford, Ill., assigned to Barber-Colman Co. Patent 1,853,667.

Power Transmitting Mechanism for Lathes or the Like. Ernest R. Llewellyn, Arlington, Mass., assigned to The Hendey Machine Co. Patent 1,853,737.

Non-Repeating Clutch. Paul R. Hahnemann, Buffalo, N. Y., assigned to Niagara Machine & Tool Works. Patent 1,853,766.

Transmission and Control Mechanism for Machine Tools. Joseph B. Armitage, Milwaukee, and Ralph E. Saving, Wauwatosa, Wis., assigned to Kearney & Trecker Corporation. Patent 1,853,795.

Wire-Working Apparatus. William Parker, Oak Park, Ill., assigned to Grigsby-Grunow Co. Patent 1,853,877.

Machine for Simultaneously Flanging and Double-Seaming the Ends of Metal Containers. Charles Joseph Rhodes, Wakefield, England. Patent 1,853,881.

Tools and Attachments

Grease or Lubricant Pumping Apparatus. Leon Trager and Harry F. Severn, Newark, N. J., assigned to Worthington Pump & Machinery Corporation. Patent 1,853,099.

Tool Holder Adapted for Motor-Driven Striking Tools. Erik Gustaf Hysing and Karl Johan Adlof Johanson, Stockholm, Sweden. Patent 1,853,128.

Measuring Instrument. John Mischker, Milwaukee, Wis. Patent 1,853,134.

Workholder. Bradford T. Borden, Lakewood, Ohio, assigned to The Borden Company. Patent 1,853,255.

Means for Controlling the Supply of Oxygen to Blowpipes. Francis S. Austin, Pittsburgh, Pa., assigned to Carbo-Oxygen Co. Patent 1,853,329.

Pyrometer Control. Albert F. Spitzglass, Chicago, Ill., assigned to Republic Flow Meters Co. Patent 1,853,469.

Surge Control for Magnetic Chucks. Frank L. Simmons, Woonsocket, R. I., assigned to The Taft-Peirce Manufacturing Co. Patent 1,853,642.

Pneumatic Improvement for Solenoid Hammers. Samuel E. Mortimer, Lorain, Ohio, assigned to Clarence M. Griggs. Patent 1,853,695.

Air Chuck. John C. Crowley, Cleveland Heights, Ohio, assigned to The Dill Manufacturing Co. Patent 1,853,723.

Adjustable Cutter. James B. Giern, Detroit, Mich., assigned to Detroit Boring Bar Co. Patent 1,853,971.

Speed-Changing Device (for grinding wheels, etc.) Carl S. Carlberg, Mound, Minn., assigned to David E. Karlberg. Patent 1,854,018.

Processes

Method of Heat-Treating Steel. Edward S. Lawrence, Pittsburgh, Pa., assigned to The Duraloy Co. Patent 1,853,439.

Conveyor. Joseph Wachter, Newark, N. J., assigned to Hanson-Van Winkle-Munning Co. Patent 1,853,525.

Controlled Conveying and Feeding of Abrasives (To a Tool). Joseph Alfred Healy, Barre, Vt. Patent 1,853,611.

Spray Gun. James E. Perrin, Toledo, Ohio, assigned to The De Vilbiss Co. Patent 1,853,636.

Furnaces

Supporting Means for Electrical Heating Elements. Edwin L. Smalley, Whitefish Bay, Wis., assigned to Hevi Duty Electric Co. Patent 1,853,382.

Strength of External Spur Gear Teeth—*Correction*

In the Reference Book Sheets under the above title (*AM*—Vol. 76, pages 479-480 and 506), an error occurred in one of the formulas.

This should read:

$$SFS = \frac{FS \times 600}{600 + PLV}$$

American Machinist
Reference Book Sheet

SHOP AIR CONDITIONING

HUMAN beings can do four times as much work in a temperature of 100 deg. F. when the relative humidity is 30 per cent than when it is 100 per cent, and can perform at maximum efficiency only between the temperature limits of 40 and 75 deg. F. Physical properties of the air, which include its temperature, moisture content, and rate of air movement, determine the comfort or discomfort felt by the human body. The optimum of the air in reference to its temperature, humidity and rate of movement consistent with comfort has been the subject of much discussion, and various standards have been suggested from time to time. It is doubtful whether there exists a single optimum acceptable to a group of individuals, since physical and skin condition, weight of clothing, and a number of other factors differ from day to day and with individuals. Therefore, it is desirable to maintain a physical environment, whenever it is possible to do so, which more nearly meets the demand of a large number of individuals, and the others, by adjustment of clothing, can accommodate themselves to the selected conditions.

Winter Temperature Conditions

A temperature range between 68 deg. F. and 72 deg. F. is generally accepted as the proper temperature for sedentary workers. The optimum varies with the severity of the work performed—the heavier the work, the lower the temperature. Other considerations, such as clothing worn, acclimation to warmer temperatures and the like, are influencing factors. A fair percentage of humidity should be provided in the air. Excessively low humidities cause the mucous membranes of the nose, throat and lungs to dry, thus lowering their resistance to infection; excessively high humidities interfere with normal evaporation from the skin and causes frosting of building windows and walls. A range of relative humidities from 40 to 60 per cent appears practical and acceptable. Air movement in the average workplace should be such as to cause no annoyance to the occupants and still be sufficient to effect an adequate air change. An air movement of about 25 to 35 linear ft. per min. is usually satisfactory.

Summer Temperature Conditions

In summer, much as indicated optimum temperature conditions seem desirable, their maintenance indoors, whenever the prevailing temperature out of doors is excessively high, is objectionable because of the sensations of intense heat or of chill experienced by those leaving or entering the building. Therefore, it has been found impracticable to reduce the indoor temperature more than 10 to 15 deg. below the outside temperature under maximum outside conditions. This reduction, provided the relative humidity has likewise been reduced, gives a sufficiently comfortable condition. The inside temperature should aproach the outside temperature as the latter approaches 80 deg. F. to avoid too great a contrast between inside and outside temperatures. Overcooling in summer is inadvisable, though perhaps not quite so undesirable as overheating in winter.

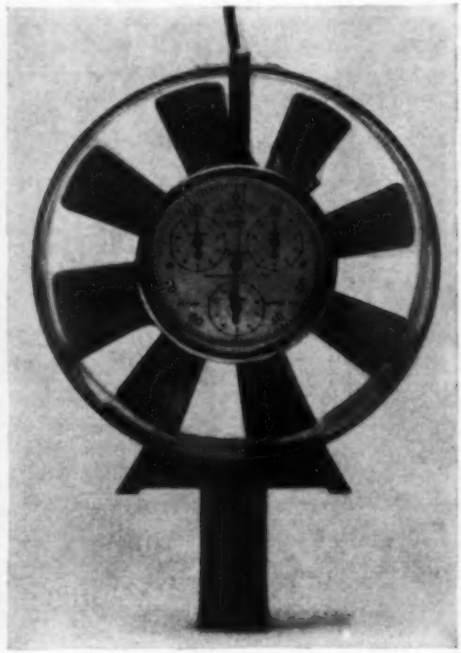
Measurement of Physical Properties of Air

So far, all attempts to design a single instrument to measure the combined effect of the three atmospheric factors (temperature, humidity, and air movement) have been unsuccessful. The ordinary mercury thermometer is inadequate. The wet bulb thermometer adds considerable information. There are a variety of instruments on the market for measuring dry and wet bulb temperatures simultaneously, varying from the type giving approximate information to those of the recording type providing a continuous reading. The sling psychrometer is a portable and convenient variation of this type of instrument. It consists of two thermometers, one a wet bulb and the other a dry, adjusted to a plate arranged to swing at the end of a short chain or about a swiveled handle. Relative humidity can be readily ascertained by reference to tables or charts after dry and wet bulb temperatures are known. (Tables prepared by United States Weather Bureau give percentage of relative humidity for conditions found, and may be obtained from the Government Printing Office for $0.10). Temperature readings should be taken at a position within the occupied area where conditions are approximately average, and at a height of about 4 ft. above the floor.

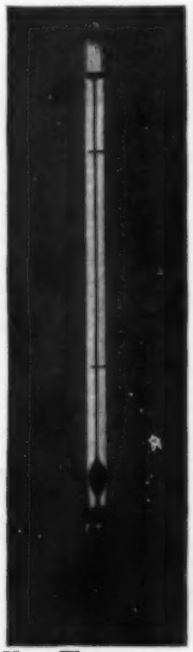
Air Motion

Air motion is measured in a variety of ways; measurement of higher air velocities is comparatively simple, and any one of the types of anemometers on the market may be used. Measurement of low velocities (under 100 ft. per min.) is more difficult. The katathermometer can be conveniently used as an anemometer, and constitutes, especially at low velocities a useful instrument is readily detecting drafts or air infiltration through windows. It sums up undirectional air eddies and currents, and is in this way superior to the vane anemometer. Fundamentally it is a specially constructed alcohol thermometer with a cylindrical bulb about 4 cm. long by 2 cm. in diameter. Its 20-cm. stem is graduated

Sling Psychrometer



Anemometer



Kata Thermometer
(*H. N. Elmer*)

(Courtesy Taylor Instrument Companies)

American Machinist
Reference Book Sheet

SHOP AIR CONDITIONING

from 95 to 100 deg. F. and ends in a reservoir at top. In taking a reading, the kata is immersed in hot water until the alcohol rises to the top reservoir. The bulb is then dried and the instrument suspended in the desired location. The time taken for the fluid to fall from 100 to 95 deg., measured by stop watch, is a criterion of the heat loss from the surface of the kata by radiation and convection. Since this heat loss is a known factor, the *rate* of loss depends entirely upon atmospheric environment, and is calculated easily by reference to tables. The thermometer can be used satisfactorily for high or low temperatures or humidities and for any given air velocity between 0 and 650 linear ft. per min. A high-temperature kata-thermometer is used where temperatures exceed 90 deg. F.

Conditioned Air

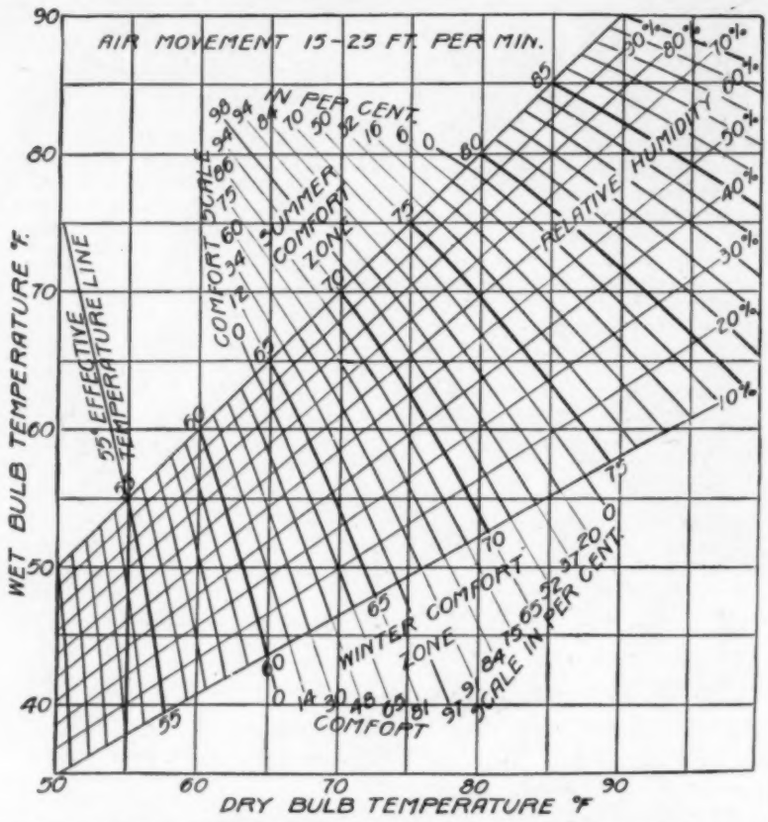
Within certain limits, the indoor physical environment can be controlled as desired. This is possible only where provision is made for effectively supplying uniformly distributed air, conditioned for human comfort and efficiency, within the occupied areas of inclosed spaces.

During the summer season when the outside temperature conditions are uncomfortably high, the air supply, instead of being heated and humidified, is cooled and dehumidified in air conditioning apparatus by contact with cool spray water which is supplied from wells or cooled by some form of refrigeration. The temperature of the spray water and the volume of air circulated are automatically regulated in such a way as to insure a controlled temperature and humidity.

Extensive research investigations conducted jointly by several United States services and the Research Laboratory of the A.S.H.V.E. have correlated the physiologic responses of the body to a wide variety of environmental temperature conditions, and have determined the temperature, humidity and air motion combinations which give equal sensations of warmth or cold. The index of these sensibly equivalent conditions of atmospheric combinations has been termed the "effective temperature." A scale indicating the various combinations of the physical air factors which are essentially equivalent has been developed as a result of these studies.

The Comfort Zone

It was found that the combinations of the physical properties of the air lying along the line indicated as 66 deg. effective temperature, gave the most desirable sense of comfort to the large majority of individuals used as subjects in the experiments, and this line is called the comfort line of the scale. The zone bounded by the lines marked



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Comfort Zone Chart

60 deg. and 74 deg. on the scale was found to be comfortable for several of the individuals of the group. During the summer season, the zone shifts to higher temperatures. The probable cold limit for summer is 64 deg. effective temperature, the probable comfort line is 70.5 deg. effective temperature and the probable warm limit is 79 deg. effective temperature.

After determining the dry and wet bulb temperatures of any area under consideration, the effective temperature is found and the probable comfort of the atmosphere in that area determined by referring to the comfort scale. Thus, a dry bulb temperature of 70 deg. and a wet bulb temperature of 58 deg. indicate on the chart an effective temperature of 66 deg. The chart applies to air movements between 15 and 25 ft. per minute.

The effective temperature scale has many practical applications. In certain industries, definite conditions of temperature or humidity or both are desirable for technical reasons. These, however, may be uncomfortable and depressing to the workers and, as a result, production lags. For instance, let us assume that for process efficiency a temperature of 85 deg. and a relative humidity of 80 per cent (wet bulb 74 deg.) with a negligible air motion are maintained. A glance at the scale indicates an effective temperature of 82 deg., far beyond the upper limits of the comfort zone. Now, in order to bring the condition within the comfort zone without affecting the products of manufacture, use may be made of air motion, the remaining air factor which may be changed without influencing the other two. If the process requires only a high temperature, the comfort of workers may be improved by further reducing the relative humidity, and, where only a high relative humidity is necessary, a reduction in the temperature will give greater comfort. In the latter two instances, increased air motion will further help to improve the comfort of those exposed. So long as the effective temperature remains below body temperature, irrespective of whether dry bulb temperature rises above body temperature or not, air motion exerts a cooling effect on the body. With the effective temperature above body temperature, air movement increases the discomfort.

Abstracted from Bulletin No. 5 of the Policyholders Service Bureau, Metropolitan Life Insurance Company.

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EDITORIALS

April 21, 1932

K. H. CONDIT • F. H. COLVIN
Editors

Another New Era

Somewhat condescendingly, we look back on those prophets of 1929 who assured the country that prosperity had become perpetual. We like to overlook our individual support of this philosophy and to recall that even then we had some misgivings regarding the eternal banishment of economic troubles.

All this has given way to a new school of thought, one which can see only a continued dilemma for business and industry. And strangely enough, many of the apostles of this creed were among those who held out the brightest hopes for the future only a few years ago.

There is no doubt that our present straits are so serious as to command searching analysis by our best minds in government and in business. We cannot afford to sit back patiently and expect these difficulties to right themselves. There is just as much danger in accepting the current gospel of hopelessness as there was in deluding ourselves with unwarranted optimism in the boom years. With our faces close to the picture, it is only natural that conditions look all black or all white. But let's not lose our sense of perspective.

More Grinding Machinery

Grinding machines have found their way into many new industries during the last decade. Not only have new methods for finishing metals by grinding come into use but active and aggressive sales engineering has discovered new fields of usefulness for abrasive cutting tools and machines.

There is still an opportunity, however, to enlarge the field of grinding machines to an appreciable extent in railroad shops. Large grinders for crosshead guides have come into general use; piston and valve rod grinding is now standard practice. Pins and bushings for valve motion work are also ground in most cases. But axle and crankpin work has so far resisted the efforts of the grinding engineer in nearly all shops.

Part of the opposition comes from the belief that the old practice of rolling the bearing surfaces of pins and axles adds to their wearing qualities. One shop, however, has found that grinding all axle and similar bearings not only saves time in machining but gives a better wearing surface and a longer life to the bearings.

Rolling axles and crankpins is supposed to workharden the surface and provide a better bearing, but whatever advantages may come from this practice are offset by the fact that a rolled bearing is not as round as one properly ground. Any lack of uniformity in the structure of the metal destroys the concentricity of the axle or pin even if it were true before rolling.

The Middle Road

Perhaps few manufacturers really feel that the solution of our economic troubles lies in a return to handicraft methods. Yet many of them appear to be following a policy that in effect straddles the issue.

They are not scrapping their machinery and substituting hand labor, it is true, but they are clinging to methods definitely outmoded. Excess equipment and excess labor seem to be accepted as an excuse for a stand-pat attitude regarding modernization.

This condition is emphasized by the unusual progress in manufacturing equipment design that has been made in the past two years. Decreased sales have put engineers on their mettle until, practically without exception, they have improved the productivity of their offerings.

Handicraft versus intense mechanization is always good for an argument, but not much can be

said for those who follow the middle course by their refusal to recognize obsolescence. They help neither themselves, their employees, nor business in general.

• CHIPS •

Party conventions impending, President Hoover calls turn in business . . . sees banking situation improved with reopenings exceeding closings in dollar value of deposits . . . Administration's fear of bonus fades as survey shows insufficient votes to pass cash outlay over veto if at all . . . Tax program speeded to relieve business anxiety . . . House committee submits Administration plan in omnibus bill . . . Bond buying by Reserve Board relieves bank indebtedness . . . $100,000,000 worth coralled in week provides means for credit expansion . . . More drastic inflation measures considered by Congress . . . Senate committee reports favorably on modified Glass Bill . . . Exchange head Whitney gives Senate list of short sellers . . . but says low stock values make bears . . . not vice versa . . . Jefferson day merely widens gap between leading Democratic aspirants . . . Al Smith suggests forgetting war debts for 20 years . . . and crediting debtor nations with 25 per cent of their imports from U. S. . . . Absence of insurgents from Republican convention will not worry Old Guard . . . Copeland prescription for getting Senate floor . . . stand up and start talking.

> A new use, or at least a use, for business indexes has been discovered. A Chicago machinery dealer signed a lease for office space. The rental varies with *The Business Week's* thermometer—$100 base, $125 when mercury reaches 85, and $25 for each 5-point rise thereafter.

$25,000,000 of hoarded money returned to circulation in past two weeks . . . *Business Week* index moves up 3 points . . . largely because of 42 per cent gain in check payments . . . Col. Ayres sees sentiment improving . . . devises "sentiment" index . . . U. S. foreign trade balance favorable by $25,000,000 in March . . . $62,900,000 for first quarter . . . Brokers encouraged by firmer bond prices . . . "Beer for taxation" move sponsored by manufacturers . . . claim that issue is not beer but whether or not it shall be taxed . . . Immigration falls to 10 per cent of quota . . . Doak recommends permanent increase in restriction . . . President Strawn of U. S. Chamber of Commerce assails cash bonus . . . commends budget balancing . . . Hold your securities says Senator Smoot . . . intrinsic value far above market quotations.

Joblessness in Europe decreases . . . Italy's unemployment fell 95,000 in March . . . End of tanks, poison gas, heavy guns, is U. S. proposal at Geneva . . . Tardieu dissenting wants League Hitlerite "storm troops" . . . Police raid Nazi armed . . . Hindenburg secure in saddle bars quarters . . . British Empire plan for gold-silver ratio is viewed favorably . . . Despite sterling depreciation British wages and prices decline . . . Infantile maladies in giant industries cause Soviet headache . . . Labor to be disciplined . . . Russia masses force near Vladivostock . . . Japs alarmed . . . Sinn Fein refuses to back De Valera as manufacturers threaten to quit Ireland . . . Chrysler "floating power" license taken by Citroen, French auto builder . . . African diamond mines close to let price catch up with supply.

> United Action drive to put 1,000,000 men to work passes half-way mark with 521,840 men employed. This is 51,438 over last week and affects 2,592 towns and cities.

100,000 make deposits on new Fords . . . production stepped up . . . to reach 1,000 a day this week . . . In response to auto demand, 12 Youngstown mills reopen . . . De Soto last week gained 95 per cent over 1931 . . . Packard February increase 270 per cent over last year . . . New Westinghouse elevator orders cover 190 units . . . Western Union-Postal Telegraph merger again discussed . . . Through absorption of St. Louis Southwestern, Southern Pacific becomes country's largest railroad . . . Steel workers may face further pay cut . . . in 1931 only 4 railroad fatalities occurred . . . one for every 150,000,000 persons carried . . . this record beats last year's low of 7 . . . Republic Steel gets $500,000 order from Southern Counties Gas Company . . . Dahlstrom Metallic Door Company gets Rockefeller center contract . . . will furnish employment for 300 men 3 years . . . M. K. & T. railroad employs 1,000 more . . . Top-heavy holding company precipitates receivership in Insull utility interests . . . Coolidge modernizes Vermont home . . . catches 13 trout . . . consignment of 500 to stock Rapidan goes astray.

· REGIONAL · REPORTS ·

NEW YORK—Probably the dullest week in this or any other year. Not a sale of any consequence reported. Navy still listing tools for bids. Industrial buying at a standstill.

NEW ENGLAND—Flurry of excitement following first showing of new Ford has definitely subsided. Orders and inquiries for tools from automotive industry likewise. This does not mean evaporation of hopeful prospects, but only, it is hoped, temporary lull. Business transactions of importance so few, group of small orders is an event.

Navy continues to supply most of these bright spots, offers chief hope for immediate orders.

PHILADELPHIA—Somewhat improved tone noted in machinery and machine tool industry. One large firm working on two prospective orders which may close shortly. Another reported marked improvement in inquiries. Otherwise situation unchanged during last two weeks.

CLEVELAND—Business at low ebb. Inquiries also decrease. Additional Ford releases result in purchase of used tools by local parts manufacturer. Firestone Tire and Rubber Co., Akron, inquiring for squaring machine for steel products division.

CINCINNATI—Machine-tool manufacturers and selling agents still pulling hard against strong adverse business current. With few exceptions, scattered orders booked came from miscellaneous users requiring single tools. Market still drab, but there is hope that before long it will begin to brighten. Fair number of inquiries coming in, but replies bring few sales.

CHICAGO—No improvement over previous week. No further downward trend possible. Two or three tool manufacturers still busy with Ford orders. Others doing nothing. Westinghouse alone in market for a tool now and then. Small outlying cities yield only prospects.

DETROIT—No important sales of machinery reported, but slight improvement noted in sales of small tools and fixtures. Somewhat better atmosphere seems to exist and there are prospects of upturn during next few weeks. Automobile sales not as heavy as expected, but with warm weather increase in volume is probable. Auto manufacturers still unwilling to make capital expenditures. As Ford swings into increased production, possibilities of increased business in many lines seem improving.

LIKE the lull before the storm, stagnation of the past week is widely interpreted as presaging the start of a general upturn. N.M.T.B.A. report shows machine tool business off considerably even from the low figure of February. March index was 32.6 compared with 37.6 for February and 59.1 for January. Three month averages were: March 43.1, February, 54.8 and January, 59.2. All classes of companies shared the drop about equally. Since the start of 1932 activities of the large companies have dropped from 52.8 to 32, those of medium-size companies from 78.4 to 33.1, and those of the small companies from 81 to 40.9. The final index figure for March, 32.6, represents 28 per cent of the business done in March last year. Usual seasonal influences normally counted on to strengthen March tool demand were missing.

REPORTS from the various districts of the country are anything but heartening as regards the state of present business. New York saw practically no activity at all. In New England the flurry of automotive interest and expectation has been damped by lack of orders. Philadelphia is dull but optimistic. Cleveland business is at a low ebb. Cincinnati tool manufacturers and agents are fighting hard against a strong adverse current. Detroit, home of automotive inactivity, is starkly disappointed in developments as far as tool purchases are concerned. Milwaukee, contrarily, while not rushed, finds business as good as at any time this year. And from San Francisco come reports of occasional orders supporting an increase in inquiries.

MILWAUKEE—Slight improvement in local machinery and machine tool trade during past two weeks. Business again as good as any time this year. This has brought out new note of optimism, even though present level is far from satisfactory. New auto models and readjusted prices have not yet resulted in new equipment orders, although Ford, Chevrolet and Chrysler have placed a few small orders and are figuring on more. One producer received small order from Navy and more lists are out. Miscellaneous users and general machinists take single units. Railroads and farm implement manufacturers not in market for tools. One manufacturer reports good and increasing business in special equipment, orders coming from automotive, electrical, telephone and tractor manufacturers.

SAN FRANCISCO—Occasional orders support increase in inquiries. A steam hammer, power squaring shear and a few lathes have been placed, part used machinery. Repair parts and replacements form bulk of business. As far as possible stocks are being cleared. There is some business, but dealers have to work to make sales.

MATERIAL TRENDS AND PRICES

A leading smelter and refiner, in commenting on the present chaotic condition of the metals market, has the following to say with regard to the situation in certain of the alloys: "The price of copper is at an historic low; tin is likewise at its lowest; lead is in close touch with the lowest price at which it has ever been quoted. There is so little distance between the present prices of these metals and zero that it is hardly possible that those who purchase babbitt and solder at present prices, can go wrong."

(All prices as of April 15, 1932)

IRON AND STEEL

Pig Iron —	Current	Mo. Ago	Yr. Ago
Birmingham, No. 2, Fdry., per gross ton	$10.50	$10@$11	$12.00
Buffalo, No. 2, Fdry., per gross ton	14.50	14@ 15	17.50
Heavy Melting Steel Scrap — Pittsburgh consuming point, No. 1, per gross ton	10.00	10.00	12.25
Furnace Coke — Connellsville, per net ton	2.25	2.25	2.50
Foundry Coke — Connellsville, per net ton	3.25	3.25	3.25
Steel Shapes — Pittsburgh, base, per 100 lb	1.50@1.60	1.50	1.65

•

Iron Machinery Castings — Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight, 275 lb:

Chicago	4.62½	Cleveland	4.50	New York	4.75
Cincinnati	4.35	Detroit	4.00		

•

Steel Sheets — Prices in cents per lb., del. from warehouse stock (except at Pittsburgh) in lots of 401 to 999 lb., ordered and released for shipment at one time:

	Pitts. Mill	Chicago	Cleveland	New York
Hot-rolled, No. 10	1.55	3.20	3.00	3.00
Hot-rolled, No. 24*	2.20	3.55	3.25	3.50
Galvanized, No. 24	2.85	4.10	3.75	4.00

*Annealed

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Seamless Steel Tubing — Cold-drawn mechanical tubing, round, .10 to .30 carbon, in lots of less than 100 ft. or 100 lb., net, at N. Y. warehouse:

— Thickness — of Wall		Outside Dia. in Inches						
		⅜	½	⅝	¾	1	1¼	1½
Inches	B.w.g.	Price per Foot						
.035	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23

•

Shapes, Plates, Bars, Etc. — Warehouse base prices in cents per lb., del. in lots of 401 to 999 lb., ordered and released for shipment at one time:

	New York	Cleveland	Chicago
Bands	3.40	3.00	2.95
Bars, soft steel	3.10	2.75	2.75
Cold fin., flat or square	3.80	3.60	3.60
Cold fin., round or hexagon	3.30	3.10	3.10
Cold rolled strips	4.95	5.95	5.50
Floor plates	4.85	5.00	5.00
Hoops	3.75	3.55	3.50
Rivets	4.00	3.30	4.00
Shapes	3.10	2.95	3.00
Spring steel	4.00	4.00	4.00
Tank plates	3.10	2.95	3.00

•

Stainless Steel — Hot-rolled bars, base, Pittsburgh, 0.12 per cent carbon, cents per lb.:

Chromium		Chromium	
15% and under	19.00	18 to 23%	23.00
15 to 18%	20.50	23 to 30%	28.00

Bolts and Nuts — Discount from list, f.o.b. mills, Birmingham, Chicago, Cleveland and Pittsburgh, on bolts (except stove), nuts, and lag screws, mill lots 75%

NON-FERROUS METALS

Prices following are in cents per lb. for mill shipments in carlots:

Aluminum ingots 99%, N. Y.	23.30
Copper, electrolytic, Conn	5.75
Copper wire, base, Chicago and Cleveland	8.62½
Copper wire, base, N. Y.	8.50
Lead, pigs, E. St. Louis	2.90
Tin, Straits, pigs, spot, N. Y.	18.45
Zinc, slabs, E. St. Louis	2.80

Prices following are in cents per lb., base, N. Y., Chi. and Cleve.:

Brass rods, high	10.25
Brass sheets, high	12.50
Brass tubing, high	15.75
Copper, drawn round	12.87½
Copper sheets	15.37½
Copper tubing	14.87½

Prices following are in cents per lb., del. from N. Y. warehouse:

Babbitt, anti-friction, general service	27.00
Babbitt, com'l, intermediate grade	32.75
Babbitt, genuine, highest grade	41.50
Solder, bar	16.00

Prices following are in cents per lb., base, Huntington, W. Va.:

Monel metal rods, hot rolled	35.00
Monel metal sheets, full finished	42.00
Monel metal tubing, seamless	65.00
Nickel rods, hot rolled	45.00
Nickel sheets, full finished	52.00
Nickel tubing, seamless	75.00

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Scrap Non-Ferrous Metals — Dealers' purchasing prices in cents per lb., f.o.b. cars:

	New York	Cleveland	Chicago
Heavy yellow brass	2.00	2.00	1.75
Light brass	1.50	1.25	1.37½
No. 1 rod-brass turnings	2.25	2.25	1.62½
Heavy copper	4.00	3.00	2.75
Light copper	3.25	2.75	2.37½

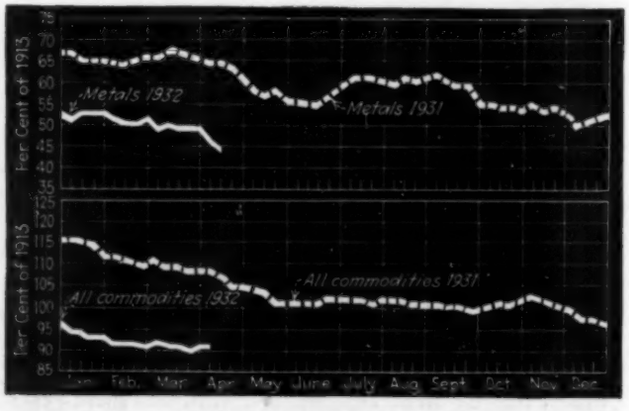
SHOP SUPPLIES

(Prices at warehouse)	New York	Cleveland	Chicago
Abrasive disks, aluminum oxide No. 50 grain, cloth, 6-in. dia., X weight, per 100	$4.37	$4.59	$4.59
Belting, leather, heavy	40–5%	40–5%	40–5%
Belting, rubber, trans., Grade I	60–10–10%	60–10%	60–10%

Lumber — Per M ft., b.m., 12–16 ft. lengths, delivered, N. Y.

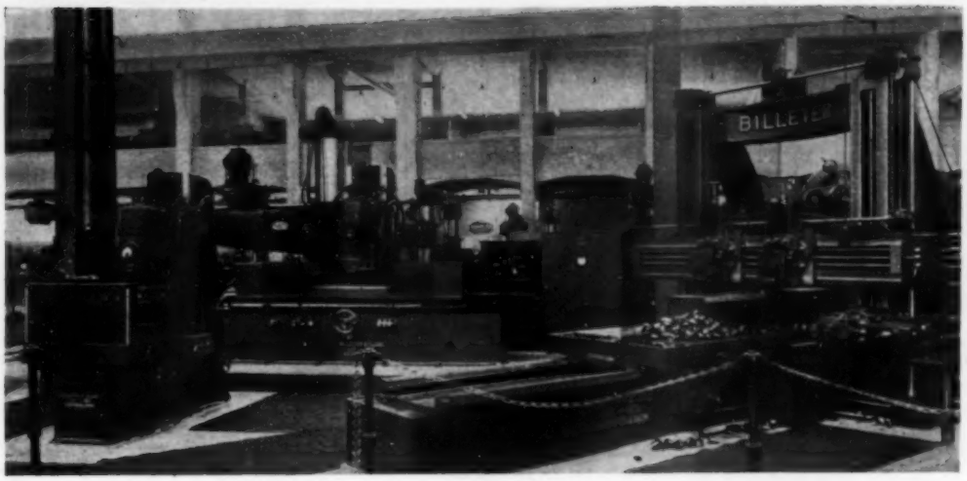
Crating — Southern pine:
1x4-in., sq. ed. ..... $27.00 1x6-in. $24.00

Skids — Spruce:
2x4-in. .$35.00 3x4-in. .$35.00 4x6-in. .$37.00 6x6-in. .$50.00


Per Cent of 1913
Metals 1932
Metals 1931
All commodities 1931
All commodities 1932
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

Price Movements Week by Week

Average Price of Raw Metals: Pig Iron, Billet Steel, Copper, Tin, Lead, Zinc—American Machinist
Seventy-Four Commodities Index—The Annalist



Working motion is provided in this planer by three rams, two for the cutting stroke and one for the return. Of 11½ ft. length, it has a cutting speed of 100 ft. per min., a return of 106 ft./min. All sliding faces are finished by grinding instead of scraping, cutting the scraping time on the 23 ft. bed to 10 hours from 40. Exhibited by Billeter & Klunz, Aschersleben

Metal-Working Machines at The 1932 Leipzig Spring Fair

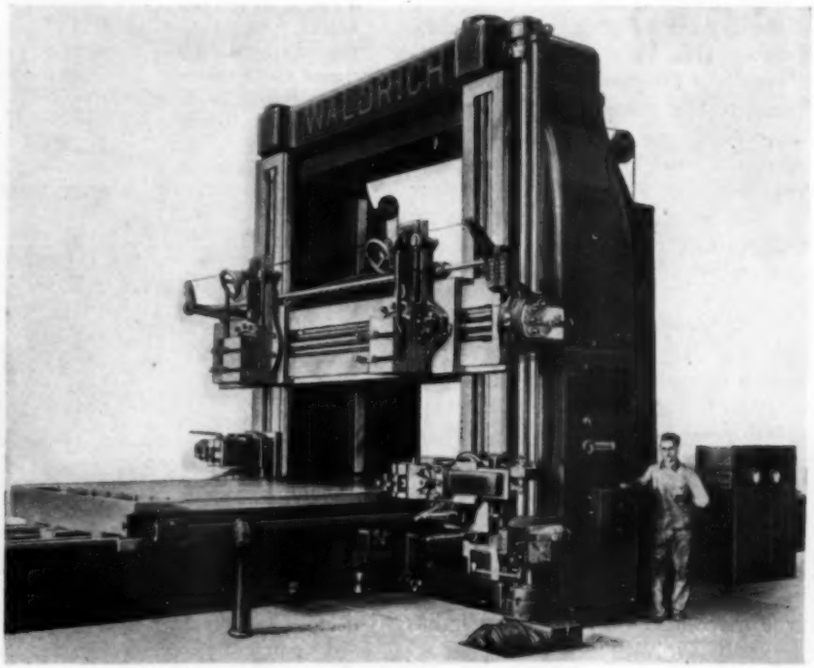
Widening world machine tool markets find American, German, British, Austrian and other equipment fighting for dominance. America's claim to sturdier, higher production, more easily maintained tools is being challenged by the lower prices, greater precision and more liberal credit terms offered by foreign builders. Under these conditions, it behooves American machine tool makers to ascertain just what new designs are announced abroad and just what competition they offer

ALTHOUGH world industry is passing through a severe crisis, a large number of European countries, hitherto purely agricultural in character, are now commencing the manufacture of metal articles within their borders. It is obvious that, because of the lack of technically skilled labor, the introduction into these countries of the products of the machine building industry must of necessity be slow. It will not be possible immediately to entrust untrained native labor with the operation of highly developed American and German machines designed to meet all the requirements of modern metal-working.

On the other hand, there has been a tendency during the last few years to design machines capable of operation by labor which, unlike its American or German counterpart, has not had the benefit of that progressive training afforded by the gradual development and perfecting of metal-working machinery during recent decades.

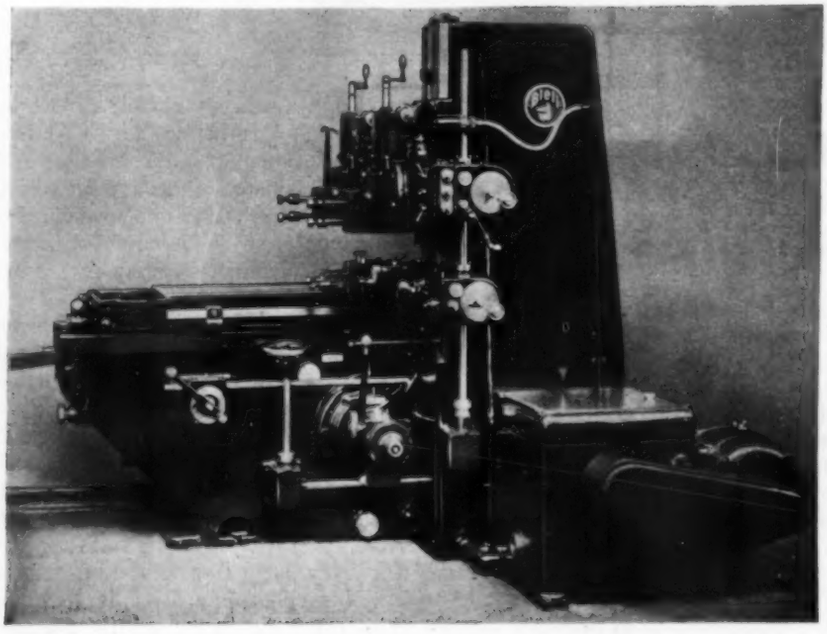
There have of course been evolved quite a number of machines which are either entirely new or the construction of which is based on quite novel ideas. In the construction of heavy machinery in particular, considerable progress has been made. It is a well-known fact that it is not always possible, even if working at full capacity, for very large machine tools to be employed continuously on large work. This often makes it doubtful whether plant operations will justify the high charges for interest and depreciation.

It was proposed to overcome this



This heavy standard planer with capacity of 10½ ft. in width by 8 ft. 11 in. in height by 19 ft. 8 in. in length has new type crossrail and housings. The two rail heads and two side heads all have automatic tool lift. Drive is through two electrically coupled d.c. reversing motors of 40 hp. each, variable from 210 to 1,250 r.p.m. Standard feeds range from 0.02-0.71 in. with long-distance feeds from 11/16 to 4 in. Shown by H. A. Waldrich, Siegen

The standard hydraulic drive for the Waldrich planer transmits up to 100 hp. It is designed for machines which require continuous speed regulation within wide limits. The drive shaft may be regulated to run at any speed between 30 and 700 r.p.m. and may be remotely controlled. The change from maximum to minimum speed requires but 1 second



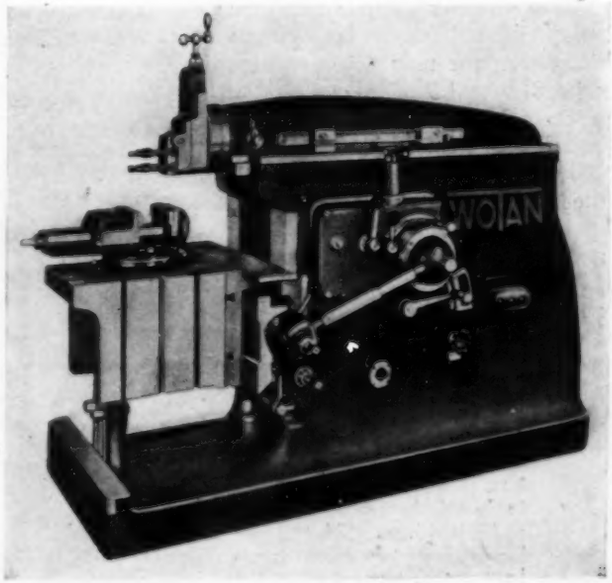
On this short-stroke planer, a heavy-duty unit for planing up to a length of 40 in., speeds can be regulated between 8 and 60 double strokes per min. hydraulically. Speeds from 2 to 8 strokes per min. are available for grinding. A speedometer shows the strokes per min. A mechanical rapid-stroke adjustment, power rapid traverse of the heads in all directions, power rail adjustment, centralized cross-rail clamping, and hydraulic tool lift are provided. Shown by Paul Blell, Zeulenroda

drawback by employing these giant machine tools, when not engaged in their main function, in the production of medium and small articles. In the absence of special attachments, however, this did not prove to be satisfactory. The power required for operating the heavy moving parts of such tools was excessive for small work, and moreover the gears were only designed for comparatively low speeds. It was therefore necessary to leave idle certain portions of the plant which were suitable only for large work, or so to combine machine tools for small and medium work with the large machine tool as to form a homogeneous unit. In order to meet these various requirements, something more is required than mere reproduction of the small machine tool on an enlarged scale. While, for example, in a small machine tool, one motor will suffice to drive the whole, separate motors are required for the operation of feeds and slides on the large machine tool. The former has gradually evolved into a single-purpose unit, while the latter has developed into a universal.

These trends in machine tool design, as well as many others, have been followed by American and German machine tool builders alike. Some of them represent entirely novel ideas, consequently deserve more than passing notice.

A comprehensive survey of development in Europe along machine tool lines is presented annually by the Leipzig Spring Fair. Here it is possible to obtain a good insight into the progress made by tool builders in Europe, and more particularly in Germany. Many of these developments are of prime importance to American builders, both as indications of developments and as examples of what competitive builders in foreign countries are accomplishing. Consequently, *American Machinist* last year instructed its Berlin correspondent to cover the Leipzig Fair. The results of his survey were presented pictorially at that time. This year again he has made a survey. The first views are shown this week.

A full-hydraulic high-capacity shaper of Wotan-Zimmermann Works, Glauchau (Saxony), is designed for particularly heavy loads and driven by a single pulley or by motor. Length of stroke varies from 20 to 36 in., and there are available 2 to 9 changes of ram speed. The cutting speed is variable because of the hydraulic drive. Horizontal travel and rapid traverse of the table in both directions are hydraulic. Horizontal table travel and vertical head travel both have automatic trips. Central lubrication and suitable safety devices are incorporated



Machine Tool Exposition Postponed Until 1933

N.M.T.B.A. Will Take Advantage of Opportunity to Show Products to World Audience at Time of Chicago Fair

THE decision of a large majority of members to postpone the scheduled Machine Tool Exposition from September, 1932, to September, 1933, was the most important action taken at the Annual Spring Meeting of the National Machine Tool Builders' Association in Columbus, Ohio, on Monday and Tuesday, April 11-12.

A large attendance of members as well as guests featured the meeting. Internal questions of policy were debated both on the floor and in group meetings at more than usual length and there was time for but two programmed speakers. DR. C. J. TURCK, president, Centre College, gave an inspirational talk at the dinner, Monday night, on the topic "Which Way America." Ralph Flanders, a past president, spoke amusingly on the subject, "A Rummage Sale of Outworn Ideas," the basis of which was bits of history culled from old records of the association.

The formal reports included the presidential address by ROBERT M. GAYLORD, president, Ingersoll Milling Machine Co.; the treasurer's report by GEORGE E. RANDLES, president, Foote-Burt Co.; and the first statement of the new general manager, BOYD FISHER.

A resolution of tribute to the late CARL A. JOHNSON, the most recent past president of the association, was adopted as prepared by the Resolutions Committee composed of E. A. MULLER, E. J. FULLAM, and H. L. OLSON. A resolution addressed to the Senate Appropriations Committee in favor of adequate support of the Bureau of Foreign & Domestic Commerce was adopted.

Reasons for Postponement

In regard to the postponement of the scheduled Machine Tool Exposition, aside from present business conditions, which were regarded as requiring increased emphasis on direct selling efforts, members considered 1933 more favorable for other reasons. They were influenced particularly by the fact that the "Century of Progress Exposition" at Chicago next year will bring many visitors from abroad who would arrange also to see a great display of machine tools in which America still leads the world, both as to quality and output.

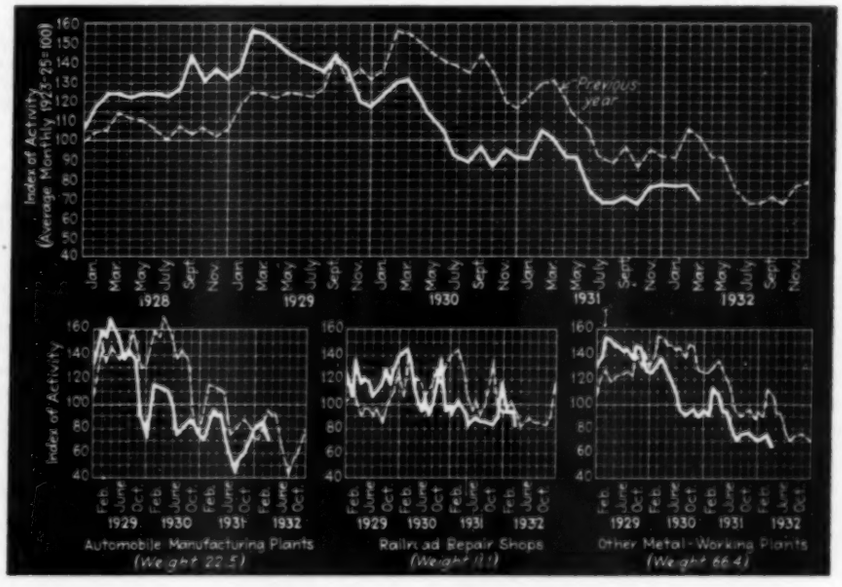
American machine tool builders have often exhibited in European industrial shows, such as the Leipzig Fair. These exhibits, while profitable in results, have been costly and necessarily limited in scope. The opportunity of showing the entire range of U. S. machine tools to European visitors on American soil was regarded as of unusual value. The total effect of an exhibition of new designs of high production tools in every line will greatly augment the impressions to be gained from successive single displays. This is especially important at the present time, because recent quota restrictions and higher tariffs have put up hurdles against American exports to Europe which it will take increased efforts to leap, and has erected barriers to the profitable use of American machine tools by European metal-working factories. The 1933 Show will be depended on to demonstrate convincingly that American machine tools still have a margin of producing capacity sufficient to absorb tariffs, or invite their overthrow.

At the same time, the new Cleveland Auditorium, designed with special regard to the requirements of the largest exposition under power, will be ready next year. The new auditorium will be large enough to house in a single hall exhibits which in previous expositions were divided between two buildings. The new structure will be so arranged that visitors may see both machine tools and accessories without moving from one building to another.

Metal-Working Activity Drops Ten to Sixteen Points in March

METAL-WORKING activity in general fell off considerably in March, according to reports on consumption of electrical energy for power purposes. The March recession followed a slight increase for February. January had been more or less static after a slight rise in December. The final March figure was 67.7, as compared with 79.2 in February, 77.6 in January, 77.8 in December, 75.6 in November, 69.4 in October, 71.2 in September, and 68 in August. These figures are all adjusted for 26 working days, as are the figures which follow.

The automobile shop index dropped to 69.2 from 85.3 in February and 83.6 in January. In previous months it was: 78.1 in December, 65.5 in November, 67.4 in October, 53.7 in September, 43.6 in August. The railroad repair shop index likewise fell off sharply from 92.6 in February to 81.9 in March. Figures for the preceding months were: 91.5 in January, 118 in December, 94.9 in November, 84.5 in October, 84 in September, 85.5 in August. Ferrous and non-ferrous metal-working plants not included in the railroad and automobile groups had a March index of 64.8, off 10 points from the February index of 74.8. In this group figures for the preceding months were: 72.7 for January, 70.9 for December, 76 for



November, 71 for October, 75 for September, and 73.3 for August.

When the figures are adjusted for seasonal variations, slight revisions occur. The railroad repair shop index drops to 78.5, and the general metal-working index drops to 59.4, while the automobile shop index falls to 60.4. This gives a total seasonally adjusted figure of 61.7 as compared with the 70.2 of the unadjusted index. Railroad repair shop seasonally adjusted indexes were, in previous months: February, 81.7; January, 86.5; December, 116; November, 90.1; October, 85.5; September, 87; August, 96.2. Similar automobile shop indexes were: February, 81.8; January, 98; December, 114.2; November, 78.1; October, 55.4; September, 52; August, 45.3. For other metal-working plants the adjusted figures for previous months were: February, 67; January, 68.7; December, 73.2; November, 78.1; October, 72.5; September, 76; August, 79.3. Figures for the entire group were: February, 72; January, 77.3; December, 87.2; November, 79.4; October, 70.1; September, 79.1; August, 73.5.

Three Taylor Society Speakers Tell How to Stabilize Business

DIVERGENT methods for stabilizing business and ending this and other depressions, if any, were offered by VIRGIL JORDAN, economist, McGraw-Hill Publishing Co., Inc., New York, WILLIAM T. FOSTER, economist, Cambridge, and H. S. PERSON, managing director, Taylor Society, New York, at a special meeting of the society, April 14, in the Hotel Lexington, N. Y. Discussion of the three proposals was taken up by the assemblage in the evening.

Dr. Jordan pointed out that periodic capital dissipation is the source of industrial instability, banking and credit paralysis and unemployment. Such dissipation, he declared, cannot be overcome by specific, centralized and planned control of production or investment within the framework of the present political and economic system, nor by altering the relative bargaining power or labor through regulation of working hours or wages; and continuous controlled inflation, while theoretically possible, is impracticable. The most direct and comprehensive device for stabilization, he advised, is the use of federal taxing power to divert surplus savings from the capital market into the consumer market by employing them for production of free, non-competitive social services.

Speaking on "Stabilization Through Money and Credit Policy," Mr. Foster said this business depression, as far as the United States is concerned, is a product of the mismanagement of bank credit by the United States. Restoration of an adequate flow of bank credit in the right channels would end the depression within a month. He advised that we abandon our policy of defeatism, our worship of the budget, our false economy programs, our complete reliance on individual initiative and collectively put into use enough currency and credit to restore the commodity price level of 1928. This degree of counter-deflation, he said, would automatically relieve all debtor nations, all debtor farmers, all debtor home-owners, all debtors of any class, of unjust and intolerable burdens caused by the deflation of the past three years; enable tens of thousands of business concerns again to operate at a profit and avert labor troubles by reducing real wages without reducing wage rates.

Adjustment of investment in plant, equipment and materials to normal demand for products, measured and specified in sales, production, investment and employment schedules and budgets, was offered by Mr. Person as a practical way in which certain of the country's best-managed concerns have achieved a noteworthy degree of stabilization. He pointed out the dangers of the present system of overburdening enterprises with unwieldy capital structures and of unloading these overcapitalized enterprises on the public by promoters of investment mechanisms. There should be regulation of total investment just as there is regulation of investment within the best-managed enterprises, he declared, and advised open consideration and formulation of a public policy rather than mere leaving the matter to implication and "spontaneous evolution."

Editors Visit G.E. Schenectady Works

Production activity may be low but research is as busy as ever. This was the discovery made by a party of about twenty McGraw-Hill editors and executives on the occasion of a visit to the Schenectady Works of the General Electric Co. on April 14.

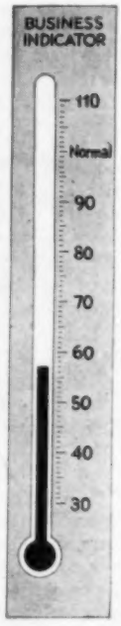
Arriving early in the evening of the 13th, the party went directly to a get-acquainted smoker at the Mohawk Club where perhaps thirty G.E. men were awaiting them. Next morning the gathering was addressed by W. R. BURROWS, vice-president of manufacturing; E. W. ALLEN and C. E. EVELETH, vice-presidents of engineering; J. C. BARRY, vice-president of sales; and L. A. HAWKINS of the research laboratory. Following the talks came a demonstration of recent research achievements and a visit to the turbine department where the latest developments in mercury boilers, ship propulsion machinery, and large turbines were explained by A. R. SMITH, turbine engineer, and his associates. The party then visited the turbine shop where some of this apparatus is under construction. The new developments stimulated much favorable comment. The editors congratulated their hosts on their forward-looking research policy.

At luncheon the combined groups were addressed by C. H. LANG, publicity department of General Electric, who was in charge of arrangements for the visit, and by H. C. PARMELEE, editorial director and vice-president, McGraw-Hill Publishing Co.; L. V. BURTON, editor of *Food Industries;* and JOHN M. CARMODY, editor, *Factory and Industrial Management.*

THE BUSINESS WEEK

April 20, 1932

Although the second quarter got a bad start, so far as security markets and banker psychology are concerned, the business picture brightened a bit during the first week of April . . . In spite of the croakers, a crocus or two stuck its head out of the sodden statistics, as usually happens in spring even though the ground is covered with discouraged worms drowned by excessive liquidation . . . Merchandise carloadings and check payments improved, and, along with a slight increase in currency in circulation, may indicate a little spring pick-up in trade . . . After allowance for seasonal movements, power production, building, and steel activity stopped declining, although the sharp expansion expected in steel demand is still delayed by sales uncertainties and production difficulties in the automotive field . . . Brightest among the spring buds produced by April liquidation is the promise of increased pressure toward credit expansion by more aggressive Federal Reserve open-market operations . . . Repeated disappointments during the past two years caution us not to count this rose till it blooms, but the banking authorities had better fertilize this form of inflation fast and fearlessly if they wish to avoid the thorns that are bound to grow on the bonus bush and the other inflation bills that desperate debtor classes are backing in Congress . . . Even abroad, in Britain, France and Germany, slight signs of improvement show that the hopefulness of spring has not altogether lost its spell . . . But the air is still chilled by the reparations problem, dead political issues, and corporation corpses ready for the undertaker.



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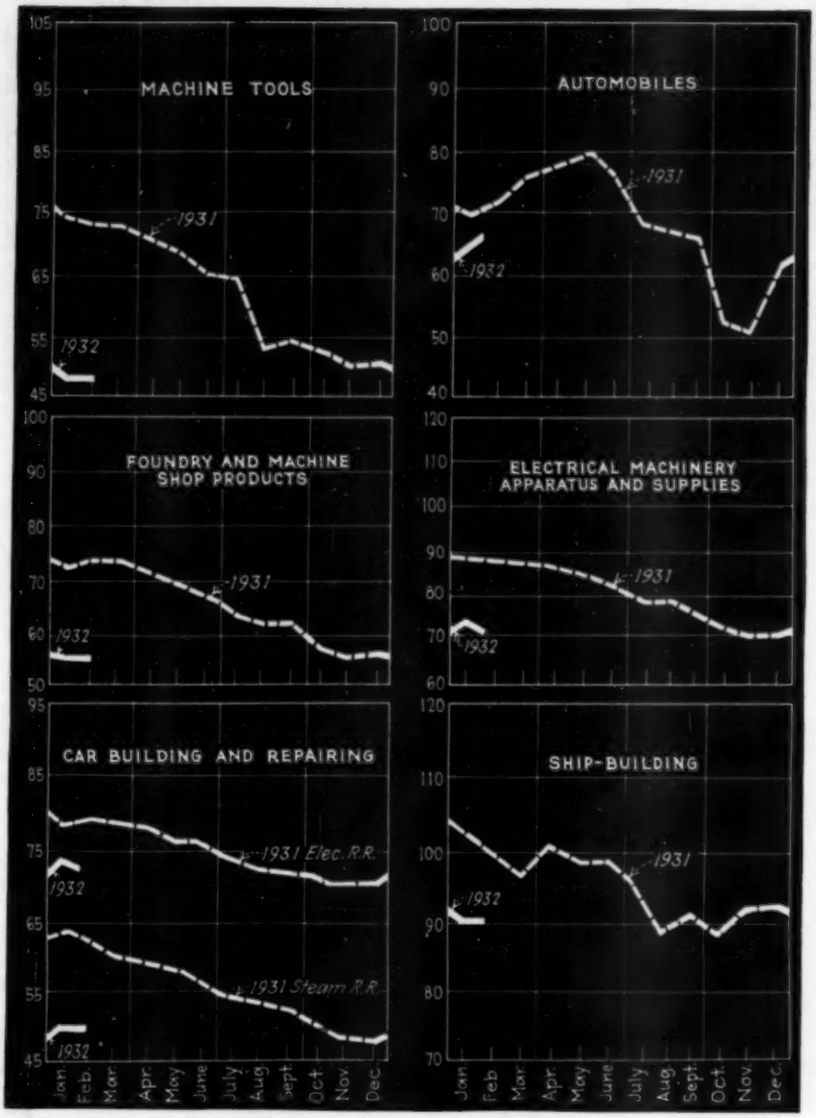

Trend of Employment in Metal-Working Industries Monthly average for 1926 = 100. Data supplied by the Bureau of Labor Statistics

• BUSINESS ITEMS •

General American Tank Car Corp. has merged its Canadian interests with Canadian Tank Car Co., Ltd., a subsidiary of Canadian Car & Foundry Co., Ltd. The new company will be known as Canadian General Transit Co., Ltd., with headquarters at Montreal, Que. Control will be retained by Canadian Car & Foundry Co., Ltd.

B-B Nut Co., Eighth St. & Columbia Ave., Philadelphia, Pa., has acquired sole licenses for United States, Canada and Mexico of all patents of Safety Nut Corp., Philadelphia.

Hartley Wire Die Co., Inc., Waterbury, Conn., has been charted to manufacture wire dies, etc., with a capital of $50,000. The incorporators are: W. M. Hartley, E. W. Hartley and A. O. Herron, all of Waterbury.

Pittsburgh Equitable Meter Co. and Merco Nordstrom Valve Co. will be merged, the latter company operating as a division of the former. The Pittsburgh concern, maker of meters and regulators, was founded by the late George Westinghouse, the valve company by S. J. Nordstrom. W. F. Rockwell, of the Pittsburgh company, becomes president of Merco. Warehouse stocks for both companies are to be carried in Los Angeles, Kansas City, Chicago and Columbia, S. C.

Remington-Rand has entered into a reciprocal technical contract with Weilwerke, Frankfurt, Germany, maker of standard and portable typewriters and accounting machines. Under this agreement, certain products and patents of each company become available to the other.

E. Ingraham Co., Bristol, Conn., has increased production of a new line of wrist watches to 3,000 daily. Volume of business in electric clocks is also on an upward trend and business in spring clocks continues good. The company manufactures its own clock motors.

Gifford Screw Products Co., Worcester, Mass., has been licensed by Dardelet Threadlock Corp. to manufacture and sell special screw machine products with Dardelet self-locking thread.

Assets of Allied Die-Casting Corp., 43rd Ave. and 39th St., Long Island City, N. Y., manufacturer of die castings, are to be sold at public auction May 3-4. Appraisal value is $130,000 and the majority of the equipment is said to be less than two years old.

The plant of the Zanesville Malleable Iron Co., idle for several months past, is to be disposed of at a private sale. At a public auction there were no bidders. The plant has been appraised at $25,000.

Randolph Clowes Co., Waterbury, Conn., owned by American Brass Co. is to be sold. Connecticut Light & Power Co. owns water rights in the Naugatuck River with Randolph-Clowes and is negotiating for release.

M. J. Geris Mfg., Inc., Hartford, Conn., has filed a certificate of incorporation signifying the company will manufacture all kinds of metal stampings. Capitalization is $50,000. Marcellus Gerdis, Mary Gerdis and A. E. Kammritz are the incorporators.

Gleaner Harvester In Reorganization

Under the name of the Gleaner Harvester Corp., the Gleaner Combine Harvester Corp., Independence, Mo., maker of harvester-thresher combines and corn combines, is being reorganized with a capitalization of approximately $500,000. The reorganization follows the recent sale of the assets and plant for $270,000 to a reorganization committee. W. J. Brace, Kansas City, Mo., operating receiver, will be president of the new corporation.

Government Orders Additional Machines

Recent government orders for machines in addition to those listed in *American Machinist* last week include: Engine lathe for delivery to Boston Navy Yard, Consolidated Machine Tool Corp., Rochester; step-up gear equipment, Philadelphia, Farrel-Birmingham Co., Inc., Buffalo; eight sets air ejector equipment and spares, Philadelphia, C. H. Wheeler Mfg. Co., Philadelphia;

metal-cutting bandsaw, Mare Island, Kemp Machinery Co.

Hoefer Mfg. Co., Freeport, Ill., is low on two drilling and tapping machines for Philadelphia yards, and C. F. Bulotti Machinery Co., San Francisco, on two lathes for Mare Island. Bids have been closed on two 3-ton overhead hand traveling cranes and one 5-ton trolley and hoist for the Pittsburgh engineer. Bids are also being closed April 19-26 on arc welding sets for Brooklyn.

Cleveland Automatic Machine Co., Cleveland, Ohio, has booked two multiple-spindle automatic screw machines for Frankford, Pa., arsenal.

Mexico Restricts Auto Parts Imports

Only companies authorized by the Ministry of Finance to assemble and finish vehicles will be allowed to import such materials into Mexico for passenger cars or trucks. A decree to this effect recently emanated from Mexico City. In all cases special customs declarations are necessary prior to the entry of merchandise.

The object of the modification is to amplify the facilities granted by the government for the development and extension of industrial plants in Mexico.

Fifth Fisher on G. M. Committee

The recent appointment of ALFRED J. FISHER to the operating committee of General Motors Corp. has definitely set at rest rumors that Fisher Bros. were selling their General Motors holdings. The operating committee, working in conjunction with the executive committee, is the directing force of the corporation. ALFRED J. FISHER'S advancement brings a fifth member of the Fisher family to the General Motors executive committee. Four of his brothers, FRED J., CHARLES T., LAWRENCE P. and WILLIAM J. are vice-presidents and members of the executive committee. LAWRENCE P. FISHER is also president of Cadillac Motor Car Co. and WILLIAM J. FISHER is president of Fisher Body Corp., units of General Motors.

• PERSONALS •

DAVID K. E. BRUCE, son-in-law of ANDREW W. MELLON, has been elected a director of Westinghouse Electric & Mfg. Co. Mr. Bruce, who is a New York lawyer, holds directorships in a number of large companies.

FRED L. FLANDERS has been elected treasurer of Houdaille-Hershey Co., Chicago, succeeding M. D. HARRISON who has resigned. Mr. Flanders is also executive vice-president and general manager.

E. B. FREEMAN, for many years vice-president and general manager of B. F. Sturtevant Co., Hyde Park, Mass., has been elected president, succeeding former Governor EUGENE N. FOSS, who becomes chairman of the board.

W. W. HANCOCK and THOMAS F. VEACH have been elected directors of Republic Steel Corp., to fill vacancies.

MARK S. JAMES has been appointed assistant vice-president of Pittsburgh Steel Foundry Corp., Glassport, Pa., and RICHARD ARMSTRONG has been made metallurgist of the same company.

VICTOR W. KLIESRATH, president, Bragg-Kliesrath Corp., has been elected a director of Bendix Aviation Co. The board was reduced from 17 to 15 members through the resignations of C. H. COLVIN and M. W. MCCONKEY.

F. H. NILES, president of Wickes Machinery Co., is continuing the business recently discontinued by that company as manufacturers' agents, appraisers, liquidators and dealers in machine tools, electrical, power and contractors' machinery. Offices have been established at 880 Bergen Ave., Jersey City, N. J.

W. SCOTT SAUNDERS has been elected president and general manager of American Forging & Socket Co., Pontiac, Mich. Other officers elected are: WILLIAM J. CLARKE, vice-president; HOWARD P. BLAZO, secretary; and FRED G. HAWKE, treasurer. Directors are re-elected.

WILLIAM H. WOODIN has been elected president of J. B. Brill Co., Philadelphia, Pa., car builder, succeeding the late SAMUEL M. CURWEN.

Activities

WALLACE CLARK, European representative of Committee on Participation in International Management Congresses, will speak on "Engineering Conditions and the American Engineer" at a meeting of the Metropolitan section, A.S.M.E., in the auditorium of the McGraw-Hill Publishing Co., 330 W. 42nd St., New York, May 24.

CLARENCE L. COLLINS, 3RD, president, Reliance Electric & Engineering Co., Cleveland, Ohio, will speak on the subject "Economic Planning" at the Providence section meeting, A.S.M.E., May 3, in the Engineering Bldg., Brown University.

O. D. CONOVER, vice-president of Foundry Equipment Co., Cleveland, for the past three years, has established a consulting engineering service on the layout and design of industrial plants and foundries. Mr. Conover for ten years was affiliated with Austin Co., Cleveland.

H. E. GRAHAM, formerly assistant vice-president of American Car & Foundry Co., New York, has been appointed assistant to president and general traffic manager of Jones & Laughlin Steel Corp., Pittsburgh, Pa., to succeed the late F. A. OGDEN.

THOMAS KAVENY, SR., president, Herman Pneumatic Machine Co., Pittsburgh, has left on a business trip for Berlin, Paris and London. He will return late in May.

ERNEST L. THEARLE, research engineer, General Electric Co., will speak on "A New Type of Dynamic Balancing Machine" at a meeting of the Metropolitan section, A.S.M.E., April 26, in the Engineering Societies Bldg., 29 W. 39th St., New York, N. Y.

WILLIAM ROBERT WILSON has resigned as vice-president and general manager of Reo Motor Car Co., Lansing Mich., according to a recent announcement by DONALD E. BATES, secretary-treasurer of the company. RICHARD H. SCOTT, president of the company for many years, will continue in that office and will also act as general manager. Mr. Wilson remains a director.

• OBITUARIES •

WILLIAM NEWTON AGNEW, 55, traffic manager and assistant to the president of Worthington Pump & Machinery Corp., New York City, died suddenly April 12 at his home in New York.

JESSE J. ARMSTRONG, 64, state representative of Rome Brass & Copper Co. for many years, died April 13 in Rome, N. Y.

WILLIAM C. GEWALT, 44, founder of Twin-disc Clutch Co., Racine, Wis., and vice-president and works manager of that company, died April 8.

RICHARD GARLICK, 60, director and member of executive committee of Youngstown Sheet & Tube Co., died April 14 at Daytona Beach, Fla.

DR. PAUL W. HORN, 61, president, Texas Technological College, Lubbock, Tex., died Apr. 13.

WILLIAM KAPLE, 59, a founder of K. W. Ignition Co., Cleveland, died there April 7. He founded the company in 1906 with J. A. WILLIAMS and was vice-president and general manager until his retirement in 1927.

WILLIAM PRELLWITZ, 52, chief engineer, Ingersoll-Rand Co., Easton, Pa., died Apr. 13 in the Easton Hospital.

WILLIAM SCHLAFGE, 63, president of Meadville Machinery Co., New York, and a former general mechanical superintendent of Erie Railroad, died at Miami, Fla., April 6. He formed the Meadville company in 1922.

JAMES MCCOBB SELDEN, president of Selden Co., West End, Pittsburgh, Pa., died April 12 at his home in that city. He founded the Selden Co. in 1917, becoming its president. He was also a director of American Cyanamid Co., of which the Selden Co. is a subsidiary, and president of Selden Steam Generator Corp. and Selden Research & Engineering Corp.

To Visit M.I.T.

New England manufacturers interested in industrial research will visit the research laboratories of the Massachusetts Institute of Technology, May 3, as the result of an invitation extended by the Institute to the New England Council.

Budget Subject at S.I.E. Meeting

Speaking on "Balancing the Budget" at the Spring meeting of the Society of Industrial Engineers, New York Chapter, April 19, in the auditorium of the McGraw-Hill Building, New York, C. E. KNOEPPEL, Adivisory Management Corp., Philadelphia, Pa., showed the distinction between two methods of budget balancing.

One way of balancing an industrial budget, he pointed out, is to do the best we can during the coming year and wait until next February or March to ascertain what the profit results have been. The efficient modern way is to plan the making of profits in advance and devise ways and means for knowing approximately what the year's showing is going to be before the end of the year.

JOHN M. CARMODY, national president of the society and editor and publishing director of *Factory and Industrial Management*, presided.

"Common Sense Applied to Time and Motion Study" will be the subject of the production group meeting to be held at 7:30 p.m., May 3, in the McGraw-Hill auditorium. Motion pictures and actual examples will augment the program.

Connecticut Group To Meet in June

At the Eighth Annual Connecticut Industrial Meeting, Camp Hazen, Chester County, June 19, the question of "Essential Factors in Industrial Relations," will be discussed. C. W. DUNLOP, Safety Car Heating & Lighting Co., New Haven, is chairman of the attendance committee. Other members of the council include JOHN E. FIELD, American Brass Co., Ansonia; FRANCIS H. GRIFFITHS, Turner & Seymour Mfg. Co., Torrington; E. A. KISSELBRACK, Corbin Screw Co., New Britain; HERMAN KOESTER, Bristol Co., Waterbury; ELIHU LYMAN, Lyman Gun Sight Corp., Middlefield; HERBERT WALKER, Colt's Patent Fire Arms Mfg. Co., Hartford, and GEORGE A. WARNER, Eastern Malleable Iron Co., Naugatuck.

I.S.A. 1932 Meeting At Milan, May-June

A conference of secretaries of national standardizing bodies and a series of meetings on technical subjects will be held in Milan, Italy, during May and June, according to information recently received by the American Standards Association, member body in this country of the International Standards Association.

The program of technical meetings is as follows: May 30, Center heights of shafts, and Specifications for iron and steel; May 31, Shaft ends, and Specifications for iron and steel; June 1, Shafting keys, and Specifications for iron and steel; June 2, Testing sieves, and Ball and roller bearings; June 3, Fluid meters, and Preferred numbers; June 4, Cutting tools (more particularly twist drills), and Preferred numbers; June 6, Meeting of secretaries of national standardizing bodies, and Widths across flats of bolt heads and nuts; June 7, Meeting of secretaries of national standardizing bodies, and Aeronautics; June 8, Automobile parts (to be continued on June 9 and 10, if necessary), and Agricultural machines.

Foreign Trade Topic Of Round Table

In connection with the Twentieth Annual Meeting of the National Chamber of Commerce in San Francisco, May 17-20, a round table conference on the subject, "Clearing the Foreign Trade Channels," will be held on the afternoon of May 19. Outstanding problems of export and import business will be presented by men prominent in their respective fields. The following topics will be considered:

(1). *Foreign Tariff Barriers to United States Export Sales*

Discussing foreign tariff levels, surtaxes, quotas, licensing; also reciprocal and preferential tariff agreements in relation to most-favored-nation treatment, and the possibility of reciprocal tariffs for the United States.

(2). *Effect of Depreciated Currencies and Exchange Restrictions on United States Foreign Trade*

Discussing U. S. tariff measures aimed to meet depreciated currency competition; the effect of such competition on our export trade; the extent and effect of exchange restriction on export trade, and "exchange clearing" arrangements.

(3). *"Buy-at-Home" Campaigns in Relation to our Export and Import Trade*

Discussing the effect of such campaigns upon our export trade and what would be the effect of similar campaigns in the United States.

(4). *What the American Chamber of Commerce Abroad can Contribute to our Trade Recovery*

Discussing American chamber activities in the field of tariffs, taxation, trade contracts, and promotion of international good will.

"The United States and the Orient" will be discussed on the afternoon of Friday, May 20. This discussion will take the form of a general review of our relationships and will also entail a specific presentation of the trade situation and the silver situation. Relationships with Canada will be the subject of an address at the Annual Meeting Dinner on the night of Wednesday, May 18. "Overseas and Coastal Shipping," taking up the present problems of overseas shipping, the importance of American shipping to our trade and travel, and intercoastal shipping problems, will be considered at a round table discussion on the afternoon of Wednesday, May 18.

• MEETINGS •

ELECTROCHEMICAL SOCIETY
Spring meeting, Baltimore, Md., Apr. 21-23. Colin G. Fink, Columbia University, N. Y., secretary.

AMERICAN WELDING SOCIETY
Annual meeting, Engineering Societies Bldg., New York, Apr. 27-29. William T. Spraragen, secretary, 29 W. 39th St., New York City.

AMERICAN MANAGEMENT ASSOCIATION
Annual meeting, Hotel Pennsylvania, New York, May 2, 1932.
Annual meeting, Institute of Management, Hotel Pennsylvania, New York, May 5, 1932. W. J. Donald, Managing Director, 20 Vesey St., New York, N. Y.

GRAY IRON INSTITUTE
Mid-year meeting, Hotel Statler, Detroit, Mich., May 3. Arthur J. Tuscany, manager.

FOUNDRY AND INDUSTRIAL EXPOSITION
Also 36th annual convention, American Foundrymen's Ass'n, Hotel Statler, Detroit, Mich., May 3-5. C. E. Hoyt, manager, American Foundrymen's Ass'n, Inc., 222 W. Adams St., Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS
Conference on maintenance, management and materials handling, Hotel Statler, Detroit, Mich., May 4 and 5. Aeronautical division. Annual meeting, Buffalo, N. Y., June 6-8. Calvin W. Rice, 29 W. 39th St., New York, N. Y., secretary.

AMERICAN GEAR MANUFACTURERS ASS'N
Sixteenth Annual Meeting, Hotel Statler, Cleveland, Ohio, May 12-13. Executive Committee meeting, same place, May 11. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

CHAMBER OF COMMERCE OF UNITED STATES
Annual meeting, Palace Hotel, San Francisco, May 17-20. D. A. Skinner, 1615 H St. N.W., Washington, D. C., secretary.

SOCIETY OF AUTOMOTIVE ENGINEERS
1932 summer meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., June 12-17. John A. C. Warner, secretary, 29 W. 39th St., New York, N. Y.

AMERICAN SOCIETY FOR TESTING MATERIALS
Annual meeting, Atlantic City, June 20-24. R. E. Hess, assistant secretary, 1315 Spruce St., Philadelphia, Pa.

NATIONAL METAL CONGRESS & EXPOSITION
174th Regiment Armory, Buffalo, N. Y., Oct. 3-7. Sponsored by A.S.S.T., with cooperation of A.S.M.E., Institute of Metals and Iron & Steel Divisions of A.I.M.E., A.W.S., and the Wire Association. W. H. Eiseman, 7016 Euclid Ave., Cleveland, Director.

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Opportunities for Future Business

Ind., Lafayette—Purdue University, R. B. Stewart, Controller, awarded contract for construction of a 3 story, 60 x 230 ft. mechanical engineering building on campus. Estimated cost $200,000. Noted March 24.

La., New Orleans—Board of Levee Commissioners of Orleans Levee District, awarded contract for construction of a group of buildings including 70 x 290 ft. administration building, 102 x 122 ft. repair shop, and 60 x 127 ft. emergency and storage building, at Shushan Airport on Lake Pontchartrain. Noted March 3.

Mass., Haverhill—Wings Transportation Co., 12 Granite St., plans construction of a service garage on Elm St. Estimated cost $40,000. Architect not selected. Maturity indefinite.

Mass., Leominster—Fitchburg-Leominster Airport Corp., Barton Crocker, 84 Prospect St., having preliminary plans prepared for construction of an airport to include hangars, machine shop, etc. G. Hadden, 607 5th Ave., New York, N. Y., Engr.

Mass., Worcester—Colonial Beacon Oil Co., 30 Beacham St., Everett, will soon award contract for construction of an oil terminal building, including garage, office, tanks, etc., here. Estimated cost $40,000. Private plans.

Mich., Detroit—Detroit Gray Iron Foundry Co., 6403 Wight St., plans completed for a 1 story addition to foundry. Mildner & Eisen. Hammond Bldg., Archts.

N. J., Hillside—Hillside Chevrolet Co., M. Bloom, Pres., 331 East Jersey Ave., Elizabeth, will build a 1 story garage and show room on North Broad St. here. Estimated cost $40,000. Construction Service Corp., 80 Broad St., Elizabeth, Archt. Work will be done by separate contracts.

N. J., Little Falls—Little Falls Laundry Co., East Main St., having revised plans prepared for construction of a 2 and 3 story, 140 x 280 ft. garage on Main St. Estimated cost $175,000. F. W. Wentworth, 140 Market St., Paterson, Archt. Otto E. Goldschmidt, 110 West 40th St., New York, N. Y., Mech. Engr. Noted March 31.

N. J., Newark—Reliable Furniture Co., 43 Market St., plans to rebuild warehouse destroyed by fire also constructing furniture refinishing plant at 9 Comes Alley. Estimated cost to exceed $40,000. Maturity indefinite.

N. J., Newark—Standard Oil Co. of New Jersey, 26 Broadway, New York, N. Y., plans completed for construction of a 1 story, 90 x 100 ft. automobile service station at Runyon St. and Elizabeth Ave. Estimated cost $40,000. Private plans.

N. J., Trenton Junction—State Board of Education, State House, completed revised plans for a 2 story, 70 x 90 ft. addition to shop building at New Jersey School for Deaf. Estimated cost $75,000. Guilbert & Betelle, 20 Branford Pl., Newark, Archts. Noted February 4.

N. Y., Brooklyn—Bee Line Realty Corp., H. B. Carter, Pres., having plans prepared for a 2 story, 45 x 55 ft. terminal, garage, platforms, etc., at Albee Sq. and Fleet St. H. R. Harvie, 370 7th Ave., New York, Archt.

N. Y., Brooklyn—F. H. Bookhop Broom & Brush Co., 451 38th St., will receive general and separate contract bids about July 1 for a garage and storage building at 38th St. and West 5th Ave. M. Klein, 65 Court St., Archt.

N. Y., Brooklyn—P. W. Connelly, 83 Church St., plans construction of a 1 story service garage at Ditmars Ave. Estimated cost to exceed $100,000. B. Driesler, 153 Remsen St., Archt.

N. Y., Brooklyn—Greenreen Realty Corp., 493 Bushwick Ave., will build a 100 x 100 ft. service garage at Kings Highway and West Fourth St. F. Fein, 1797 Pitkin Ave., Archt. Work will be done by separate contracts. Maturity after October.

N. Y., Brooklyn—M. Friedman, 236 Montgomery St., will receive bids about August 1 for construction of a 100 x 120 ft. service garage at Utica Ave. and Winthrop St. S. L. Malkind, 93 Court St., Archt. Noted April 7.

N. Y., Brooklyn—M. & R. Du Britz, Empire Blvd. and New York Ave., having sketches made for a 35 x 68 ft. service garage. J. A. Boyle, 367 Fulton St., Archt.

N. Y., Brooklyn—Ramlo Realty Corp., c/o W. Volman, 222 Eagle St., having sketches made for a 1 story, 50 x 100 ft. service garage at India and Oakland Sts. J. A. Napoli, 369 Fulton St., Archt.

N. Y., Brooklyn—Standard Oil Co. of New York, 26 Broadway, New York, awarded contract for addition to industrial plant including blower building and metal shed at Kingsland Ave. and Norman St. here.

N. Y., College Point — Corp., c/o John R. Thompson Agency, 29-28 Hunter Ave., Long Island City, will receive general or separate contract bids about July 1 for reconditioning ship yard including additional facilities here. Estimated cost to exceed $40,000. Noted November 12.

N. Y., Flushing—G. Di Gerolamo, 13 West Bradford Ave., plans construction of a 100 x 125 ft. service garage at James St. and 41st Ave. P. L. Kieswetter, 367 Fulton St., Brooklyn, Archt., will receive bids on separate contracts later.

N. Y., New York—Carlonesto Realty Corp., 391 East 149th St., will receive bids after May 15 for construction of a 1 story, 65 x 130 ft. service garage and automobile laundry at Jerome Ave. and Kingsbridge Road. W. N. Del Gaudio, 545 5th Ave., Archt. Noted March 24.

N. Y., New York—Martin O'Dowd & Co., 300 Riverside Dr., having sketches made for alterations to 3 story service garage on 11th Ave. W. Vale, 50 Church St., Archt.

N. Y., New York—M. S. and R. Rosenfeld, 56 East 115th St., awarded separate contracts for alterations to 4 story service garage. S. Roth, 1182 Broadway, Archt. Noted February 4.

N. C., Concord—Charles E. Boger, Supt. of Stonewall Jackson Training School, will soon award contract for construction of a 3 story, 35 x 88 ft. trades building at Jackson Training School including woodworking, machine, print, furniture repair, tin and electric shops, etc.

N. C., Winston Salem—Hinde & Dauch Paper Co., 3400 East Biddle St., Baltimore, Md., awarded contract for construction of a corrugated shipping box factory here. Machinery and equipment, etc., to cost $150,000 will be required. Charles Van Wagner Co.'s representative at Winston Salem.

Pa., Du Bois—Kendall Refining Co., Kendall Ave., Bradford, will soon award contract for construction of a 1 story, 60 x 80 ft. service station here. Bacon & Lurkey, 997 Main St., Buffalo, N. Y., Archts. R. G. Howard, Dep. National Bank Bldg., Dubois, Assoc. Archt. Noted May 14.

Pa., Erie—Erie Casket Co., W. C. Kibler, Pres., 1901 Sassafrass St., awarded contract for a 2 story, 70 x 130 ft. factory. Estimated cost $40,000. Noted March 31.

Pa., India — Rochester & Pittsburgh Coal Co., Church and Carpenter Sts., plans remodeling office building into laboratory and will install new laboratory equipment. George Smith, Maple and Oakland Aves., in charge.

Pa., New Castle—Citizens Lumber Co., plans reconstruction of lumber yards and plant destroyed by fire. Estimated cost to exceed $40,000. Maturity indefinite.

R. I., Pawtucket—Frank Cook Inc., 103 Exchange St., plans construction of a 1 story, 80 x 330 ft. automobile sales and service station on North Main St. Estimated cost $100,000. A. Addeo, 17 Broadway, Providence, Archt. Maturity soon. Noted December 17.

Tenn., Athens—Athens Stove Works, awarded contract for construction of a 1 story, 125 x 200 ft. addition to plant and foundry. Estimated cost $40,000.

Tex., College Station—A. & M. College, awarded contract for construction of a 3 story, 114 x 256 ft. agricultural and engineering building. Estimated cost $200,000. Noted March 3.

Wash., Tacoma—Puget Sound Manufacturing Co., 1123 St. Paul Ave., plans to rebuild 1 story, 100 x 125 ft. woodworking plant recently destroyed by fire. Estimated cost $100,000. Private plans. Work will be done by day labor.

Wis., Appleton—Tschank & Christensen, having plans prepared for a 2 story, 30 x 120 ft. addition to plant for the manufacture of sheet metal products. LeVee & Gmeiner, Archts.

Wis., Eau Claire—National Pressure Cooker Co., 1515 Ball St., awarded contract for a 1 story, 50 x 100 ft. addition to plant.

Ont., Woodstock—Wood Mosaic Co., Highland Park, Louisville, Ky., plans construction of a branch plant here for the manufacture of hardwood products. Estimated cost $30,000.

United Soviet Socialist Russia—c/o Amtorg Trading Corp., 261 5th Ave., New York, N. Y., will build a can manufacturing plant at Saransk Middle Ural region, 51 million cans annual capacity. Work will be done by day labor and technical aid contracts.

United Soviet Socialist Russia—c/o Amtorg Trading Corp., 261 5th Ave., New York, N. Y., will build a ship building plant in Ural region, 90 dredges and 150 tugs annual capacity. Estimated cost approximately $33,000,000. Work will be done by technical aid contracts.

Equipment Wanted

Calif., Mare Island (sta. Vallejo)—Bureau of Supplies & Accounts, Navy Department, Washington, D. C.—will receive bids until April 26 for one motor-driven engine lathe. Sch. 7799.

D. C., Washington—Bureau of Supplies & Accounts, Navy Department—will receive bids until April 26 for motor driven milling machine and attachments for Navy Yard, New York and or San Francisco. Sch. 7813.

Ia., Des Moines—Yellow Cab Co., 1100 Walnut St., cylinder reboring machine, motor and electric bench grinder.

Minn., Minneapolis—Elmer E. Chinander, 3520 15th Ave. S.—general garage and body shop equipment.

Minn., St. Paul—Brown-Jaspers, Inc., 2441 University Ave. (manufacturers and distributors of soda fountain equipment)—woodworking machinery mortiser, tenoner, table saw, planer, belt sander and motors.

Minn., Springfield—Wilder Bros.—generator type electric welder.

N. J., Newark—Standard Oil Co. of New Jersey, 26 Broadway, New York, N. Y.—miscellaneous machinery and equipment including drum lathe, air standards and compressors, etc., for proposed service station at Runyon St. and Elizabeth Ave.

Tenn., Nashville—A. & I. State College, Centennial Blvd.—forge, woodworking and manual training machines for college building.

Wash., Tacoma—Puget Sound Manufacturing Co., 11233 St. Paul Ave.—woodworking equipment for 1 story plant destroyed by fire.